JOURNAL OF

# The American Geriatrics Society

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THE JOURNAL OF

# The American Geriatrics Society

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## GERIATRIC ASPECTS OF PRIMARY ENDOMETRIAL CANCER

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Geriatric gynecology encompasses a wide variety of functional and organic disturbances which, with the exception of cancer, are rarely of more than passing importance in their relation to health and happiness. On the other hand, cancer of the genital system always is a serious threat to life. Were it otherwise, 20,000 would not have to die yearly in this country from uterine cancer alone, and that in spite of nationwide efforts to impress upon the populace the importance of early diagnosis. Although delayed diagnosis evidently accounts for much of our failure to reduce the present high death rate from cancer, it is not at all improbable that the very nature of the disease at times defies all known methods of treatment right from the beginning. This sobering thought is injected here, not in the spirit of defeatism but, because at this stage of our knowledge of the genesis of cancer, we have no better explanation for our failure to achieve a cure of an early well localized cancer, as recently discussed by McKinnon (1). However, whether or not the principle involved be right or wrong, there is no reason for relaxing our efforts to improve curability by fighting against delayed diagnosis. Since genital cancer increases with declining years, it is doubly important that those concerned with geriatric medicine take particular cognizance of this fact. Endometrial cancer is discussed here primarily as a geriatric problem, distinct and different from that of endometrial cancer of the reproductive years.

### MATERIAL

The material used was collected in private practice during the years 1930–1942 and 1946–1948, comprising 107 cases in sixteen years. Fifty-one of the patients were past the age of 60 and therefore constitute a geriatric problem. For the sake of numerical significance, the material has been augmented at times with figures culled by Dr. Helen Hu from the records of 82 patients treated by various attendants in the Private Gynecologic Service of Children's Hospital, San Francisco. Among these 82 patients, 30 were over the age of 60. Figures from

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the cancer files of the Stanford Women's Clinic (including 57 patients treated between 1940 and 1949, of whom 24 were older than 60) have been utilized for comparison.

In connection with this material, it should be mentioned that endometrial cancer is not a common tumor and that in total number it ranges below cervical cancer, although it exceeds the latter numerically in the later decades of life. Because of its relative infrequency, large series are rarely collected in private practice and few endometrial clinical studies approximate the statistical significance of cervical cancer studies. The smallness of the samples used here, therefore, allows only tentative conclusions. Yet, considering that it is not always the size of statistical material that counts but the care with which it is treated, some useful information may be imparted even by these relatively small samples.

## RESULTS AND DISCUSSION

### Factors relating to age and incidence

That the study of endometrial cancer fits in well with geriatric practice is readily demonstrated in Figure 1, which shows the age distribution of 240 patients, comprising three groups of 80 patients each.

As is readily seen, the incidence of endometrial cancer is greater above the fiftieth year of life, demonstrating that aging and the increase in numerical frequency go hand in hand. In this connection it is of importance to call attention

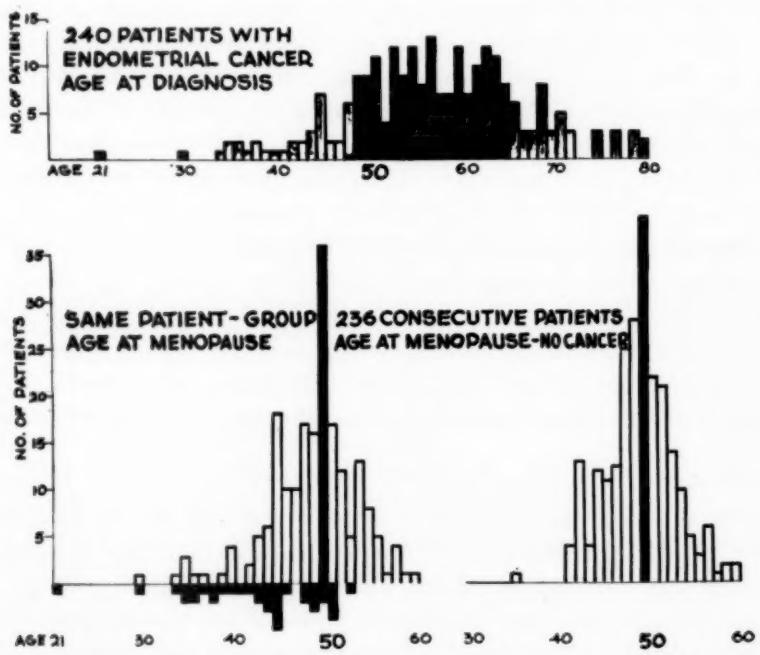


FIG. 1. *Above:* Composite graph of age distribution of private and clinic patients with endometrial cancer. *Below:* Menopausal ages for the same group as contrasted with ages for similar group not afflicted with cancer. Blocks below base line indicate numbers of patients still menstruating at the time of discovery of cancer.

TABLE 1

*Age Distribution for 199 Cervical Cancers and 189 Endometrial Cancers*

(Source: two private series.)

| | Age Groups | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 20 | 21–30 | 31–40 | 41–50 | 51–60 | 61–70 | 71–80 | 81+ |
| Cervical cancer: | — | 7 | 26 | 61 | 58 | 30 | 15 | 2 |
| Endometrial cancer: | 1 | — | 9 | 21 | 79 | 59 | 19 | 1 |

TABLE 2

*Ratio between cervical and endometrial cancer in clinical and in private practice*

| | Cervical Cancers | Endometrial Cancers |
|---|---|---|
| Stanford Women's Clinic 1940–49 | 306 | 57 or 15.7% |
| Children's Hosp., Private Service 1940–49 | 70 | 82 or 53.9% |
| Emge, Private Series, 1930–42, 1946–48 | 129 | 107 or 45.3% |

to the fact that deaths from all forms of cancer in women double after the age of 35, increase fairly evenly to the age of 50, and after the menopause climb more rapidly, to double again after the age of 75. In principle, this observation also applies to cancers of the reproductive organs in general, and to endometrial cancer in particular. It is noteworthy that at the age when there is a decrease in gonadal function the incidence of benign genital neoplasia declines while that of cancer steadily increases. In the fifth decade cervical cancer reaches its peak and drops off thereafter. From the beginning of the sixth decade, the endometrial type leads all genital cancers in numbers, as shown in Table 1, which presents the age and frequency distribution for the two types of uterine cancer in the two series of private patients.

Concerning the comparative frequency of the two most common cancers of the genital system, tradition places the ratio somewhere between 8:1 and 5:1 in favor of cervical cancer. This does not necessarily apply to private practice, in which these malignancies are more often encountered in a ratio of 2:1 or 1:1, as depicted in Table 2, and as recently commented upon by Tweeddale *et al.* (2). The difference in frequency distribution between clinic and private practice may not be of any particular significance, beyond the fact that older women seek private care because their economic status permits it. It is very doubtful that it means that endometrial cancer is a disease of the well-to-do, as Graves once suggested (3). Nevertheless, the private practitioner engaged in the care of geriatric patients may expect to see more and more of endometrial cancer as the volume of his practice increases and as more and more women reach geriatric age levels.

## Etiologic factors

Although we know little about the etiology of endometrial cancer, and can only resort to conjecture, it is of clinical interest that hormones, particularly

estrogen, have been implicated in the genesis of cancer. The much belabored estrogen-cancer hypothesis stems from animal experimentation, largely concerned with the genesis of mammary cancer in mice and later applied to other rodents and to monkeys. Opinions on the validity of the hypothesis are divided, but on the whole the weight of evidence absolves estrogen and damns heredity (4, 5). The little that is known about the inherited disposition to endometrial cancer was discussed by Way (6), who cites Sir Halladay Croom and Purdie as having observed the disease to occur in identical twins at the same age levels. Way also refers to Brobeck's statement that there is a significant increase of corpus cancer in the mothers and sisters of patients suffering from the disease, compared with the relatives of normal women. In Warthin's study (7) of the predisposition to cancer of the famous 'Family G', it was shown that in three generations of 174 persons, 43 cancers developed in 41 individuals; 15 cancers of the endometrium developed in 23 of the females. In my private series, endometrial cancer developed in one set of sisters within five years after the menopause and several women reported the occurrence of the disease in their mothers and maternal aunts. This is too big a subject to be discussed here but attention is called to the possibility that hereditary predisposition may be a factor in the genesis of endometrial cancer—adenomatous hyperplasia repeating itself—particularly during the menopausal years (8).

As far as the clinical significance of the estrogen-cancer hypothesis is concerned, it may be of some interest to review briefly the approaches used to implicate estrogen. They are a) the study of estrogen imbalance in relation to endometrial hyperplasia as a forerunner of cancer (8–12), b) the coexistence of uterine fibroids with corpus (endometrial) cancer (13), c) the incidence of this cancer in relation to feminizing ovarian tumors (14), d) the late menopause as an indicator of abnormal estrogenic stimulation (15), and e) the occurrence of endometrial cancer in individuals treated with estrogen over long periods of time (12). When these propositions are analyzed on the basis of age levels and in adequately large numbers, the indictments leveled against estrogen lose much of their significance.

Endometrial hyperplasia, commonly regarded as an expression of uncompensated estrogenic stimulation, at times precedes and also accompanies endometrial cancer; yet it is not a common occurrence in our experience. In 342 different specimens of endometrial cancer we found only 9 instances of diffuse adenomatous hyperplasia and 2 of cystic hyperplasia. A survey of the histories of 100 clinic patients and 100 private patients revealed that only 7 had been previously treated for adenomatous, and 1 for cystic hyperplasia (12). A review of the specimens of the 51 elderly women discussed in this paper revealed only 2 instances of marginal adenomatous hyperplasia existing between the cancer and the otherwise atrophic endometrium, which speaks against estrogenic stimulation. All of the remaining 49 specimens showed various degrees of endometrial atrophy. These observations indicate that in these older women estrogen is not important as a cancerigenic agent.

The existence of fibroids in the uterus afflicted with endometrial cancer was

studied by von Geldern (13), who surveyed 1,780 uteri removed by hysterectomy from our clinic patients during the period 1921–1936, and compared them with 974 uteri removed at autopsy and collected by our Department of Pathology. He found that 50 per cent of the hysterectomy specimens, as against 20 per cent of the autopsy specimens, contained fibroids. This finding demonstrates that a chance factor of concentration attached to operatively collected material may distort statistics. In both series endometrial hyperplasia, as well as endometrial cancer, was relatively rare in fibroid uteri, which led ven Geldern to conclude that the concurrence of the two tumor entities most probably was a coincidence. In elderly women it is evident that fibroids are not an indication of estrogenic activity; they are mere residues of tumors that have lost their growth impulse. During the reproductive years, when fibroids grow actively, their presence in malignant uteri suggests estrogenic hyperactivity, although the absence of endometrial hyperplasia in most of these uteri should warn against hasty conclusions. Clarification of this question, however, is easily provided by a study of women well past the period of ovarian activity.

The high incidence claimed for endometrial cancer coexisting with feminizing ovarian tumors most probably is also due to a factor of chance which has to do with the concentration of material and with the interpretation of the adenomatous pattern of atypical hyperplasia of the endometrium. When the incidence is studied on the basis of large numbers it loses most of its significance, as shown by a compilation of 753 feminizing ovarian tumors accompanied by 23 endometrial malignancies (3.3 per cent) (14). This approximates the chance occurrence of endometrial cancer with ovarian tumors in general (16).

Concerning the late menopause as an indication of overly prolonged and uncompensated estrogenic stimulation (15), it can also be shown that this factor does not have the significance claimed for it. In Figure 1 the menopausal ages for 240 individuals afflicted with endometrial cancer are compared with those of a numerically similar group of women long past the menopause who did not have cancer. The similarity of the menopausal ages of the two groups is evident, and is further emphasized when the menopausal curves for patients 50 to 60 years old are compared, as shown in Figure 2. The variation in the time which elapsed between the menopause and the discovery of cancer emphasizes that the menopausal factor is an unpredictable quantity (Table 3) and not supportive evidence for the estrogen-cancer hypothesis as it relates to endometrial cancer.

The final, and perhaps the most important premise from the geriatrician's point of view is the rare occurrence of breast and endometrial cancers in patients treated with estrogenic substances over long periods of time. The writer has discussed this interesting problem elsewhere in connection with *estrogen imbalance in relation to uterine cancer* (12) and here only calls attention to the fact that now enough time has elapsed to learn more about this problem from the vast number of patients all over the world who have been treated with estrogenic substances for all kinds of disturbances attaching to physical decline. The great rarity of the development of cancer in women so treated weakens the premise, particularly since the instances described deal with patients in age groups known to

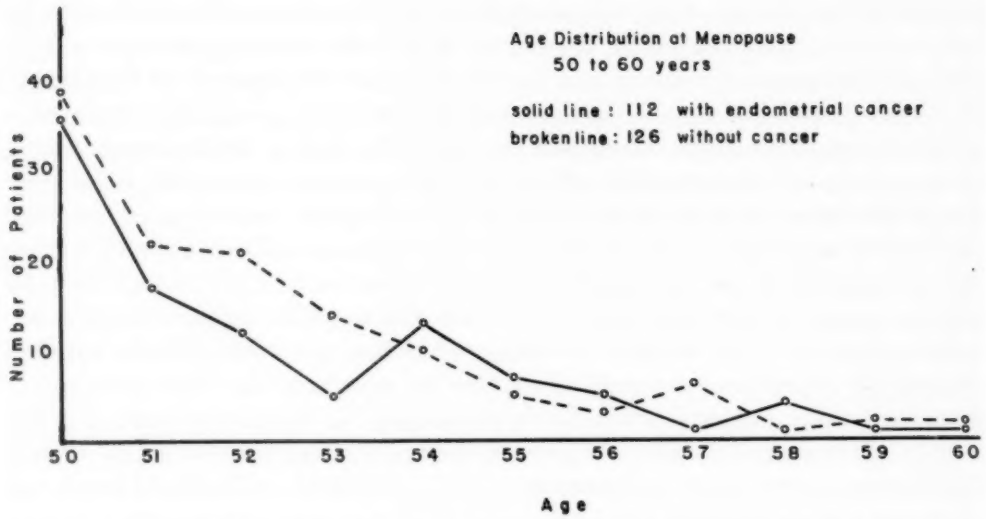


FIG. 2. Curves showing age at time of menopause in cancerous and in non-cancerous patients 50 to 60 years old.

TABLE 3

| | Time in years between menopause and discovery of endometrial cancer.* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1–5 | 6–10 | 11–15 | 16–20 | 21–25 | 26–30 | 30+ | *Total* |
| Children's Hosp. series:.... | 6 | 9 | 15 | 6 | 4 | 2 | — | *42* |
| Private patients:..... | 2 | 9 | 17 | 9 | 8 | 5 | 1 | *51* |
| Total..... | 8 | 18 | 32 | 15 | 12 | 7 | 1 | *93* |

* In 72 per cent of patients cancer was discovered ten to thirty years after the menopause; and in 37.5 per cent sixteen to thirty years after the menopause.

favor endometrial cancer. Instead of blaming estrogen for initiating cancer the better explanation might rest with the observation that the endometrial cancer cell, like its normal antecedent, increases its tempo of growth under the stimulus of estrogen, and decreases it in the absence of the hormone, as is well known in the case of endometrial cancers in old women. The lesson to be learned is that estrogen may hasten the appearance of symptoms and therefore may be a blessing in disguise, certainly for older women past the menopause whose uterine passages are not obstructed. As matters stand in clinical studies of the estrogen-cancer relationship, the evidence is against, rather than for a primary implication of estrogen in the genesis of endometrial cancer.

This fragmentary discussion of estrogen-cancer relationships may appear rather remote from geriatric problems; but since the study of the problem in aging women has contributed so much to its clarification, it does not seem out of place to acquaint the reader with the basic problems engaging the attention of gynecologic investigators. However, this discussion would not be complete

without calling attention to the increased incidence of diabetes mellitus, pathologic obesity and hypertensive disease in patients afflicted with endometrial cancer, in order to point out that there are other etiologic factors yet to be explained. Findings reported many times by others also applied to the 51 elderly private patients referred to in this paper. Six of them (11.7 per cent) had moderately severe diabetes; 7 (13.7 per cent) showed pathologic obesity of the pituitary type; and 12 had hypertension far beyond limits explainable on the basis of age alone. As compared to the 56 younger women of this series of 107 cancer patients, the incidence was almost twice that in the younger group. Whether age factors concerned with an increased frequency of degenerative diseases, or pituitary factors are involved remains to be clarified. From the geriatric angle the etiologic importance of the concurrence of these disease entities is evident, and since metabolic diseases increase with aging a greater incidence of endometrial cancer may be expected in these patients.

## Symptoms and diagnosis

It is axiomatic in gynecologic practice that, regardless of its character, any *persistent vaginal discharge discovered during the postmenopausal years be considered indicative of cancer of the genital tract unless shown to be otherwise.* Acknowledgedly, there are other causes for vaginal discharge, but at the geriatric age level they are uncommon and easily differentiated. To institute treatment without proper examination or without an iron-clad diagnosis adds immeasurably to the dangers of delayed diagnosis. Scheffey in his analysis of 2,765 cases of pelvic malignancy (17) pointed out that although in 1,110 cases the patients had been solely at fault, diagnosis also was delayed in 462 instances by physicians and in 412 instances by both patient and physician. He estimated the average delay to have been fourteen months, which does not speak well for the response to our ceaseless efforts to educate doctor and patient alike to the dangers of delayed diagnosis in its relation to curability.

What Scheffey described is not an isolated experience, but probably more widespread than is acknowledged. It certainly is not unusual to encounter it in private gynecologic practice. As a matter of illustration, the following 2 cases are reported, in which the situation could have been avoided, particularly since the patients were alert to the possible presence of corpus cancer:

*Case 1. Mrs. L. K.*, aged 65, nullipara. The menopause occurred at the age of 48, incident to radiation therapy for menorrhagia attributed to uterine fibroids. At the age of 63 a persistent vaginal discharge prompted her to consult an internist, who attributed the condition to *senile vaginitis because a single cytologic smear had been reported "negative for cancer."* When urinary frequency brought the patient to a competent urologist, but treatment failed to bring relief, estrogen therapy was instituted on the assumption that senile vaginitis explained the situation. Frank bleeding brought about a request for consultation *eighteen months after the onset of symptoms.* Pelvic examination revealed the characteristic signs of corpus cancer, namely a soft patulous cervix exuding a mucoid dark brown discharge which increased after manipulation of an enlarged softened corpus containing a number of residual fibroids. Immediate endometrial biopsy yielded excessive material which, even grossly, was suggestive of cancer. Because they were freely movable, and in the absence of physical

conditions contraindicating surgery, the pelvic organs were removed along with the lymph nodes. An anaplastic slowly growing cancer was located in the left horn of the fundus. The unaffected portion of the endometrium was atrophic and the lymph nodes were not invaded.

*Comment:* A negative result from a single cytologic study is an inadequate criterion for diagnosis, particularly when corpus cancer is under consideration. Endometrial biopsy or curettement should have been instituted without delay in the presence of a mucoid discharge occasionally bloodstreaked. Changes in the appearance and the consistency of the cervix should have aroused suspicion in a patient aged 65. The delay of eighteen months in arriving at a reliable working diagnosis is a serious break in the discipline mandatory for an efficient fight against cancer.

*Case 2. Mrs. V. C. V.*, aged 60, was a graduate nurse working in a busy doctor's office. She had three children, and the menopause had occurred at the age of 51. When she was 58 years old a thick profuse vaginal discharge prompted her to seek advice from her employer, who advised medicated douches *without examining her*. When the discharge became bloody after nearly two years she was given estrogen on the basis of delayed menopausal symptoms, but still no examination was made. When the patient was seen by me, the cardinal symptoms were evident and the presence of an anaplastic cancer was confirmed by endometrial biopsy. Preoperative irradiation with radium, was followed by radical surgery. The iliac lymph nodes were found to be invaded. Treatment was continued with postoperative roentgen therapy.

*Comment:* A mucoid discharge seven years after the menopause suggested cancer somewhere in the uterus. Bleeding at the age of 59 indicates cancer in most instances. To have given the patient medicinal therapy without examination seems incredible in these times of intensive graduate education. The radical treatment instituted most probably will not compensate for the delay in diagnosis.

The symptoms of adenomatous cancer of the uterus, whether endometrial or cervical in origin or both, invariably begin with a mucoid discharge which in time becomes blood-streaked and turns to frank bleeding as the surface of the cancer breaks down (18). In young women this symptom may be obscured by dysfunctional bleeding and uterine fibroids which then are growing actively. In women past the menopause such a discharge is pathognomonic for uterine cancer, in spite of the presence of residual fibroids, and it gains further diagnostic importance when there are changes in consistency of the uterus as expressed by a softened, slightly dusky cervix with a patulous canal. Manipulation commonly increases the discharge. A softened and enlarged corpus further hints at the presence of cancer. Fixation and tenderness speak for invasion. The discovery of metastatic vaginal lesions makes it certain that the disease has escaped the uterus. Vaginal metastases often are overlooked because they are very small and because they are located close to the urethra or in the middle third of the vagina where the examining speculum may hide them.

Occasionally, the cervical os is stenosed to the point of apparent closure, although intra-uterine pressure may force a minimal amount of tell-tale discharge into the vagina at times. This condition is confusing unless it is associated

with uterine cramps, enlargement of the corpus, and the changes in consistency just described. Immediate examination under anesthesia is then mandatory. The presence of pyometra may obscure the disease, although cautious currettement and the meticulous study of smears made from the pyometrial accumulation should prove the presence or absence of the disease.

The differential diagnosis is concerned with the exclusion of cervical, vaginal and tubal malignancies, endometrial polyps, degenerating pedunculated submucous fibroids, feminizing ovarian tumors and the rare vascular disturbances of the uterus incident to sclerosis. Neither the so-called withdrawal bleeding incident to estrogen therapy, nor atrophic vaginitis, should ever be accepted as the final answer until cancer has been excluded.

The best tools for mechanical diagnosis are, in the order of their importance: a) endometrial biopsy (or curettement if biopsy is technically impractical or the apparatus is not available), b) the cytologic smear, and c) hysterography (19) (used occasionally to determine the local extent of the disease). Scheffey and Warren discussed the incidence of false negative findings in vaginal smears, which may run as high as 20 to 30 per cent in the diagnosis of corpus cancer. They felt that for the physician treating older women, the Papanicolaou-Traut cytologic method of diagnosis is an important means of further reducing the number of delayed diagnoses and thereby the number of deaths from uterine cancer (20). However, this will depend first of all upon the reliability of the cytologic diagnosis, and secondly upon its interpretation in relation to clinical symptoms and physical findings. In my experience the value of the smear, so reliable for cervical and other surface cancers, cannot compare with the great value of endometrial biopsy or curettement in arriving at a quick and reliable diagnosis in almost 100 per cent of cases.

The interpretation of symptoms of corpus cancer in women well past the menopause, on the basis of physical examination and technical aids, is a simple diagnostic problem in the practice of geriatrics, provided the rule laid down in the introductory paragraph is observed at all times.

**Treatment, curability and survival**

The chance for survival from endometrial cancer depends upon several factors, the interrelationships of which determine curability. The importance of early diagnosis has been stressed already. Its significance increases in direct proportion to the time which has elapsed between the appearance of symptoms and the discovery of the tumor, as well as the degree of cellular differentiation and capacity for invasiveness. Although always important, delay is less of a menace in the presence of a well differentiated tumor, particularly in elderly individuals, than in the presence of an anaplastic tumor which is unpredictable in its invasiveness even though age and the absence of estrogenic stimulation may retard it at times. The second important factor is the proper selection of the method of treatment best suited to the circumstances, such as technical and clinical operability in relation to the extent of the growth and its radiosensitivity. The third important factor is the age of the patient. In my experience, young women

fare worse than the elderly, because in them anaplastic tumors are more common. The term endometrial cancer has been used here in the strict sense of the word and does not include cervical adenocarcinomas, although the term 'corpus cancer' has been used interchangeably with endometrial cancer to relieve terminologic monotony.

The treatment of endometrial cancer follows several well established methods: 1) preoperative, intracavitary irradiation with radium element, followed by total hysterectomy and total adnexectomy, with additional regional lymphadenectomy when indicated; 2) surgical removal as described, at times augmented with postoperative roentgen-ray therapy; 3) fractional intracavitary irradiation with multiple radium applicators (radium pack) devised by James Heyman of the Stockholm Radium Hemmet, followed by hysterectomy if the radiation therapy fails (21); and 4) a combination of radiotherapeutic methods, when constitutional factors exclude surgery.

The treatment of the inoperable cancer is strictly palliative, either by means of radiotherapy or by supportive drug treatment. Male hormone therapy, which Miller *et al.* reported to be ineffectual in retarding endometrial cancer (22), has also failed in our hands in patients treated with an average dose of 500 milligrams of testosterone proprionate per month administered parenterally. The experience with cancerilytic and radioactive isotope therapy is too recent to warrant discussion.

Each method of treatment has its advocates. The radiation results reported from the Stockholm Radium Hemmet are most promising with a five-year survival rate of 61.6 per cent for 665 patients treated (19); yet there was approximately a 13 per cent radiation failure, *i.e.*, patients who required hysterectomy subsequently. It is also interesting that radiation was followed by a 1.3 per cent primary mortality, which is no improvement over primary surgical mortality in well selected cases attended by experienced operators. To date, no equivocal evidence has been presented which would allow us to believe that surgery can be dispensed with. In many quarters it is felt that if the disease appears localized and well differentiated in its cellular character, immediate surgery without radiation is the best therapy. To this program the author subscribes wholeheartedly, since it is less time-consuming and more direct, regardless of which way one looks at it; and in the end, it is less expensive and physically no more incapacitating than repeated intra-cavitary radiation therapy. Moreover, the surgical approach permits immediate search for regional lymphatic involvement. A 13 per cent radiation failure can only mean that either the cancer was radioresistant or that the cancer was not reached by intra-uterine radiation once the malignant process had progressed beyond the confines of the uterus. Additional transabdominal radiation is helpful, provided the disease is radiosensitive and still confined to the pelvic regional lymph nodes. The occasional palliative radiation of other accessible lymph nodes is a matter of judgment. Vaginal metastases, or recurrences in the vaginal cuff, are best treated with fractional radium therapy. The exenteration operation for disseminated uterine cancer is a highly questionable procedure and certainly not applicable to the

aged. Selection of a method of treatment is largely predicated upon attitude and experience. The extensive literature on the subject is filled with controversial opinions (23). For the moment we may accept that if the therapy used is of proved value and carefully planned, it will hold out the best chance for prolonged survival and cure.

Concerning curability, it is generally recognized that in addition to the favorable effect of early diagnosis, the nature of the growth influences the result of treatment to a considerable extent. Well differentiated neoplasms of the Grade I and II varieties, if still localized, offer a better prognosis for ultimate recovery than the often more advanced anaplastic varieties with their tendency to metastasize early and distantly. In women past the menopause, the age factor exerts a strong influence upon the tempo of growth, because estrogenic stimulation is lacking unless derived from the adrenals. Highly anaplastic tumors reach distant points with amazing speed, although apparently still confined to the uterus. As a rule the invasion of the subendometrial lymphatic plexus by anaplastic tumors occurs early. It is unrealistic to assume that if the tumor is visually confined to the endometrium, it first must grow through the muscle layers of the uterine body to reach beyond. Anaplastic tumors metastasize to the lungs and elsewhere at an early period of their growth, leaving the patient apparently technically operable but actually clinically inoperable, or rather, clinically incurable. Distant lymph nodes suspected of bearing cancer should be removed for diagnosis, if readily accessible. According to Henriksen's survey (24), the metastatic spread of endometrial cancer affects the lungs, liver, peritoneum, ovaries and large bowel (in that sequence) more often than other structures. It is therefore necessary to search for distant foci, particularly if the character of the tumor is anaplastic, in order to determine the extent of the disease in relation to the projected treatment. It is useless to subject a patient to extensive surgery if distant spread of the disease can be demonstrated, for it serves no other purpose than to increase the mental and physical misery of an already distraught fellow being.

Survival is measured in terms of periods of five years, based on absolute or relative rates, which depend upon whether the data are all-inclusive or selective in the light of technical and clinical operability. There are wide variations in cure rates, probably depending upon the character of the growth and the efficacy of the treatment, but also upon age distribution of the patients and the percentage of curable cases. Five-year survival rates may vary from a low of 35 per cent to a high of 65 per cent for absolute cures; and from a low of 50 per cent to a high of 80 per cent for relative cures, depending upon whether or not deaths from diseases other than cancer are included.

The five-year survival rate for 107 patients treated by the writer between 1930 and 1949, exclusive of the war years, is 57.2 per cent for absolute cures and 64.7 per cent for relative cures. The subsequent "follow-up" for the entire group is not sufficiently complete to be included, except for the elderly 51 patients reported here. For these 51 patients, who were over 60 years old the rates are as follows:

1. Survival for five years or longer: Absolute rate, 70.6 per cent; relative rate, 80 per cent.
2. Survival for ten years or longer: Absolute rate, 37.3 per cent; relative rate, 42.3 per cent.

In arriving at these figures all deaths, regardless of cause, were included, although 15 of the 21 deaths were attributable to intercurrent disease, largely cardiovascular in nature, with more than half occurring from eight to twenty-one years after treatment.

It is also of geriatric interest that 19 of the 44 patients operated upon with or without radiation had passed their seventieth birthday. They made uneventful recoveries with no primary mortality, the first death occurring from pulmonary embolism ten months after operation. All but 7 patients were treated surgically, with 21 receiving preoperative, and 4 postoperative radiation which was well tolerated in each instance. Seven patients were not operated upon, but were treated with radium and roentgen therapy because they were unusually obese or were poor cardiac risks; yet 3 of these lived longer than ten years. Even if this series is small and the percentages may not be statistically significant, the experience described here testifies to the fact that advanced age is no contraindication to surgery and radiation. It also suggests that there is a greater chance for longer survival and ultimate cure because the nature of the disease in these elderly women is of a more benign character and often of slower growth and, hence, more amenable to treatment *provided it is discovered in time.*

## SUMMARY

This discussion deals primarily with the aspects of endometrial cancer which might be of interest to the physician engaged in the care of the diseases of aging women.

Attention has been called to the increasing frequency of endometrial cancer during the years beyond the menopause.

The importance of early diagnosis in its relation to symptoms and curability has been emphasized.

The etiology of the disease has been discussed in relation to its increased frequency in older women afflicted with certain metabolic and vascular diseases. The etiologic relationship between estrogenic stimulation and malignancy has also been discussed, for the purpose of clarifying its significance in regard to the genesis of endometrial cancer in the geriatric patient.

Methods of therapy and survival rates have been analyzed.

A study of cases from the private practice of the author is presented, to demonstrate that neither the aging nor the old differ in any way from the young in their ability to withstand mechanical therapy or in their capacity to respond well to surgery or radiation, or both. Moreover, their chances for recovery and survival are greater than in the young.

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# PHYSICAL MEDICINE AND REHABILITATION: APPLICATION TO GERIATRIC PROBLEMS

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The age of indifference and neglect has passed; instead, the era of the "aging" is before us. Mounting concern and emphasis is being given to the problem of our aging population. Studies dealing with economic, social and vocational problems as they concern old people have been noticeably more frequent. Likewise, geriatric medicine has come into prominence as it treats of the aging and the aged; it is both a science and an art, as is all of medicine.

The subject of physical medicine and rehabilitation has a direct bearing on a large number of the problems of the aging. Therefore, the frame of reference on this entire field is so large that it will be necessary in this paper to confine consideration to some of the major issues.

Considerable progress has been made in recent years in the sphere of physical medicine and rehabilitation as applied to geriatric problems. In any project in which it is planned to rehabilitate older individuals, the first step is to survey carefully the needs of the group in order to get an evaluation on which to base future planning. The recent President's Commission on the Health Needs of the Nation (1) stated, "The presence of more than 13 million persons in the United States over 65 years of age has focused attention on a whole new set of health problems." In the same way, a survey should be accomplished in any community, state or other area where a rehabilitation program will be initiated. The findings should be made available to the rehabilitation team so that valid planning may be consummated.

The health maintenance aspect of the entire aging problem needs a great deal of development. Physical medicine and rehabilitation can contribute significantly in promoting positive health in older persons. Medically prescribed activities in this field are admirably suited to maintain and even to increase the health reserves of these aged individuals. This type of health promotion would include rehabilitation techniques for the prevention of illness and disability, with the objective of halting impairment of health and onset of disability. The physiatrist, with his rehabilitation team, would contribute as part of the total resources brought to bear in an aggressive approach in such a prevention program. Prior to implementation, and in addition to the initial overall survey described, a comprehensive health inventory would be made for each individual. Physical medicine and rehabilitation can be of real help in the matter of measures for reconditioning and in pre-vocational activities to determine and increase work capacity, physical tolerance, mental alertness and emotional stability.

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During the first National Conference on Aging (2) in 1951, I was privileged to be a participant. I was impressed by the following observation, "Even a cursory glance at public almshouses and mental institutions will reveal many hopeless and pitiful older persons who are in the final stages of deterioration. A most striking fact about these cases is that, in many instances, much of the tragic consequences could have been prevented, provided the disabling conditions were caught in time. If we devote as much attention to reaching people before the advent of irreversible pathology and to preventing serious complications as we do to remedial measures, then we will have gone far toward meeting the health needs of the aging." We must come to realize the economic and social urgency to extend our services to this constantly increasing segment of our population. If we fail to recognize the importance of this challenge, we shall gradually fall farther and farther behind in the overall potential health level of this country.

In physical medicine and rehabilitation there are numerous specific measures which may be utilized in the definitive treatment of disease and disability of almost every category and degree. This has been amply demonstrated for many years, but especially since World War II. Our colleagues in the specialties of internal medicine, surgery, neurology, psychiatry, pediatrics, obstetrics, and chest diseases rely on the physiatrist for procedures in his armamentarium to help their patients as a part of the active therapeutic regimen in acute illness. This applies to illness in old people as well as to illness in the younger age groups. We know that motivation, hope for the future, return of self-respect and restoration of confidence are even more important in the older individual, and these factors can often be instilled by the dynamics of physical medicine and rehabilitation.

The greatest utilization of physical medicine and rehabilitation is naturally in the specific area of rehabilitation for the aged. In speaking of the restoration of older persons to jobs, Rusk (3) stated, "Lacking specific measures for the cure of many of the diseases which produce this tremendous load of disability, medicine must look to rehabilitation for the 'restoration of the handicapped to the fullest physical, mental, social, vocational and economic usefulness of which they are capable.' " We must realize that purposeful and constructive activity within physical tolerance is the primary mover in this cause. Kountz (4) has given his opinion on this subject as follows: "Physical activity and rehabilitation are also important. Encouraging individuals to be active physically leads also to mental activity. Interest in the environment and realization that he is an important factor in society, particularly with those whom he holds dear, are stimulating adjuncts to the health of the older person. Since the secret of both physical activity and mental alertness lies in the maintenance of good health, however, the medical aspect of this problem is far more important than any other in the field."

Complete treatment and care of older people requires that adequate rehabilitation services be available. At times, properly prescribed physical medicine and rehabilitation may correct a disability entirely, being usually most helpful in restoring function in whole or in part. Again, with appropriate measures in this

field the progression of disease or disability may be retarded or halted. We must not overlook the value of these modalities in restoring aged persons to the point of self-care, or to full or part-time employment.

When the patient has returned to his home and the community we must be sure that his resocialization will be satisfactory. Otherwise, disappointment and frustration will rapidly undo the accomplishments of rehabilitation, and the individual will be a candidate for readmission to the hospital or clinic. The additional tragedy of this situation is the loss of time for the patient, the wasted work of medical personnel, and the sunken hopes of the patient for ever achieving self-sufficiency.

Follow-up information should be obtained from all patients who have returned to their homes; this is the only accurate method by which the success or failure of a rehabilitation program can be truly measured. It is often difficult to determine the long-range results of rehabilitation, and searching procedures must be instituted. These may include careful surveys and visits by social workers, reexaminations and evaluations by the physician, and interviews with employers.

Every effort must be made to place the old individual, properly and selectively, in suitable employment. If, in this process, we counsel the person and not the disability we are sure to meet with the best success. Garrett (5) has aptly expressed this thought, "A major factor in the success of a vocational guidance program for the disabled revolves around the extent to which the program makes provision for the individual analysis of the person to be served. We must concentrate on studying our clients as individuals and on making our appraisals as well rounded as possible." The foregoing principles apply equally to the vocational counselling of the aged.

The Task Force on the Handicapped (6) made the following report: "We are becoming a Nation of older people. In 1900, the average life expectancy of Americans was 49.7. The 1950 statistics of the National Office of Vital Statistics have shown that the average life expectancy in this country has increased to nearly 68 years. If this trend, and the causes behind it, have been accurately analyzed, then we may expect that the average age will continue to ascend for many years. While average age has been climbing, there has not been a corresponding reduction in the incidence of disabling conditions among older people. Advanced age, as it has in the past, continues to take its toll in chronic illness and injury."

In physical medicine and rehabilitation we have visualized the enormous challenge in this outlook. It has been shown that directly related to increased age in the human is the greater incidence of chronic illness, disability, degenerative diseases, and physical and mental impairment (7). Progressive deterioration is inevitable in most patients in these categories. Chronic disease and severe disability increase in direct proportion to the age of the individual; along with this there is a feeling of frustration and futility on the part of the older patient. Frequently he suffers a violent reactionary depression because of the hopeless outlook. Even the physician often has an attitude of hopelessness in considering the prognosis for him. This entire concept must and can be changed! Just as

physical medicine and rehabilitation can serve all of the specialized fields of medicine, so can it make one of the greatest contributions in the field of geriatric rehabilitation. The application of its principles and procedures to prevention, diagnosis, treatment and rehabilitation in the sphere of geriatric illness and disability opens a field of opportunity unequalled in the realm of medical practice.

In this approach we must be thorough; it is essential to individualize our work. Stieglitz (8) observed, "Motivation for the efforts requisite for improvement is of primary importance. Without the will to improve health, little can be accomplished. The will merely to survive does not suffice; this may only perpetuate chronic disablement. The person with long-term illness will make strenuous effort to improve his health only if there is adequate motivation for so doing. Humans will not make an effort to jump out of an uncomfortable situation until they can see a place to land which seems to be more comfortable and happier than where they are. Rehabilitation is impossible without effort on the part of the patient; effort will not be expended without adequate motivation supplied by the promise of greater happiness."

In physical medicine and rehabilitation we insist that each member of the rehabilitation team—the executive assistant, therapists of the various categories, the clinical psychologist, social worker and vocational counsellor—exert every effort to motivate the patient and constantly perpetuate the patient's interest in his own recovery and restoration to independence. This technique may demand the establishment of competitive elements among the older patients, each one striving to outdo the other, but always under careful medical supervision. We must assist the patient in setting realistic goals for himself and to make practical and feasible plans for accomplishing them. He should realize that the rehabilitation process is a well-marked road to his objectives and that he will be skillfully guided during his journey to his home and community. The older patient needs our constant supervision and careful help each step of the way. The following excerpt expresses the importance of this principle: "The beneficial effects achieved through understanding and motivating the patient may be wasted unless he is helped to make the transition from the rehabilitation center to his home. Leaving the center means exchanging a sheltered environment, designed specifically to meet the needs of the disabled, for one which may present many physical and social problems. The more gradual the transition is, the easier is the adjustment. Yet, the best laid plan may run into unforeseen snags. For this reason, it is often desirable to follow-up on the patient after he returns home. In this way, the problems of the transitional period can be minimized, and the re-integration of the former patient into community life made more certain." (9).

There is a vast challenge in this total problem for education in order to promote better understanding of the importance of health maintenance, rehabilitation, and community re-integration for our aged citizens. This health education should be realistic, factually sound, and geared to orient health workers, families, the lay public and the older people themselves with reference to problems of the aging. Stevenson (10) stated, "Fundamental to our attitude toward the ills of old people is our placement of a low level of value on human worth in the de-

clining years. With the young patient we have great feeling; with the aged, little. The treatment of old people is the yardstick of our civilization. Is it sturdy or weak? Does it show that we are likely to withstand the tests to which our humanity is subjected in many aspects of life today?"

The progress we have made to date in physical medicine and rehabilitation in our contributions to this vast problem form a firm foundation from which to plan and project future strategy for more efficient operation and more effective results. We must all explore together the possibilities for the aged in our economy, in our society and in our industrial world. Reinartz (11) stated, "Medical science has added years to the average life of our people, but we have thus far not met the challenge of teaching the elderly to live as socially useful individuals. Emphasis in this young country has been on youth and production. We have, up to this time, dwelt on the infirmities and limitations of the older individual, rather than on his remaining and very real capabilities. Now, we have been made increasingly aware of the impact of this mounting array of millions of people over the age of 65."

Our objective must be to make older men and women capable within their physical and mental limitations of being useful to themselves and to society. This is distinctly at variance with the present dismal viewpoint existing in many quarters that age alone is frequently the cause of disablement of the individual, both in relationship to himself and to society. We realize that psychologic difficulties of the aging person may be seriously disabling. The further insults of forced retirement and the feeling of uselessness cause increased deconditioning and demoralization. These are the forces we must overcome!

Our Physical Medicine and Rehabilitation Service in the Veterans Administration is a comprehensive one able to meet the basic needs in the field of geriatrics with a dynamic therapeutic regimen. We have found that the conditions which afflict aging patients offer especially favorable opportunities for the application of physical medicine and rehabilitation methods. We in the Department of Medicine and Surgery have given a great deal of attention to the matter of medical care and dynamic rehabilitation for aging veterans. Our well integrated physical medicine and rehabilitation service, through a team approach and positive application, is accomplishing worthwhile results. The more than 20 million veterans of this country are a significant part of the entire population. Rusk has said that both the Veterans Administration and some civilian hospitals have demonstrated that rehabilitation to the point of self-care, and even to full or limited employment, is possible for many of these patients. Yet in many of our civilian hospitals the patient receives no such services. Many hospitals complain that the aged and chronically ill are the cause of their crowding, yet they do little to provide these patients with the geriatric rehabilitation services that will permit them to leave the hospital and return to their communities. If we rehabilitate these patients to the physical demands of daily life they will leave the hospital. Medical crumbs thrown to them are not enough; if they are given a whole loaf in the way of a complete rehabilitation service it will serve them as the staff of a new life and we shall once again have able oldsters in our ranks!

The Chief of the Physical Medicine and Rehabilitation Service is a physician trained, experienced and interested in this field, who serves as the captain of the rehabilitation team. He frequently has an Executive Assistant, a lay specialist in rehabilitation methodology, who assists him by coordinating the numerous aspects and facets of a dynamic rehabilitation program, and who also handles the medical administration of the service. He serves as counsellor and adjustor. This gives the physician much more time to devote to the medical and clinical phases of work, and is especially valuable since trained physician man-power is critically short in this field. Qualified therapists compose the component sections of the service, which are: physical therapy, occupational therapy, corrective therapy, educational therapy and manual arts therapy. In certain installations where the need exists there are, in addition, a Blind Rehabilitation Section and an Audiology and Speech Correction Section manned by qualified therapists in these special areas. The closest liaison exists with the departments of clinical psychology, social service, vocational counselling, nursing, dietetics, the chaplaincy and special services. The team approach is further strengthened by consultation services with all other medical specialties in the hospital. The chief of the Physical Medicine and Rehabilitation Service also serves as Chairman of the Medical Rehabilitation Board, which is the pace-maker of coordinated and integrated team methods for accomplishing the rehabilitation objective for each patient. All rehabilitation therapy is individualized and carried out by prescription. In many hospitals it has been found to be of definite value to establish physical medicine and rehabilitation bed services which are under the jurisdiction of the physiatrist. This enables him to apply especially intensive rehabilitation measures and to give the closest personal supervision to those patients referred to his service.

The Veterans Administration believes in the dynamic rehabilitation of the aged veteran, and in his effective and selective employment following his restoration to usefulness. We believe this constitutes reconstructive medicine at its best!

The Physical Medicine and Rehabilitation Service of the general medical and surgical hospital, Veterans Administration Center, Los Angeles, California, has published a twenty-page report (12) entitled, "It Pays to Rehabilitate," describing the results accomplished with 105 patients with a mean age of 55 years, who had various chronic conditions. Other professional groups participated in the overall objective, so that the entire project was one of a team approach. The study concludes: "While the field of geriatrics is in the realm of general medicine, it is reasonable to assume that the improvement of this particular group is largely the result of the full range physical medicine and rehabilitation service program. In terms of dollars and cents, the discharge of 76 patients from the general medicine and surgery hospital is saving the government approximately $30,550 per month. Since these patients were considered permanent custodial or nursing problems, the savings are real and would ordinarily have been a monthly expenditure until the patients died."

This and other studies accomplished by the Physical Medicine and Rehabilitation Service of the Veterans Administration show economic savings comparable with those reported in the past by the Baruch Committee, Dr. Howard A. Rusk,

and others. The study proves forcibly that early referral to such a Service is to be emphasized, since several patients of the group were referred to us after long-term hospitalization because of the common opinion that they would not respond to intensive rehabilitation procedures. Nothing could be further from the truth! Finally, the study confirms again the effectiveness, efficiency and economy of the present organizational pattern of comprehensive physical medicine and rehabilitation as it exists in the Veterans Administration.

The challenge we face in the health, rehabilitation and employment problems of the aging will continue to increase in complexity, degree and scope. Instead of a hopeless attitude and a few palliative measures for the aging and the aged, we must engender a feeling of hope, optimism and reassurance, and apply them in a positive approach toward the problem. An aggressive and direct attack must be made through adequate physical medicine and rehabilitation services working in close harmony with the rest of the medical profession.

We shall then find a new approach to living for our aging citizenry. We shall prove that age is no longer a valid reason for remaining on the side-lines of life. Rusk (13) has effectively expressed this thought, "With the growing increase in chronic disability resulting primarily from an aging population, medical care cannot be considered complete until the patient has been trained to live and to work with what he has left. Rehabilitation is a medical responsibility."

## SUMMARY

The facts and statistics pertaining to the increasing longevity of our population are well known. Increasing age also increases the possibility of multiple pathologic processes in the individual, with associated difficulties in management, treatment and rehabilitation. The resulting medical, economic, psychologic and social problems presented by an aging population are demanding more and more attention.

Physical Medicine and Rehabilitation has made a definite contribution to the solution of this problem in a total team approach with other medical specialties and health groups. Much remains to be done in order to combat this gigantic challenge successfully. The application of the principles and techniques of rehabilitation makes possible the restoration to normal activity and to some degree of employment the elderly individuals suffering from a variety of chronic diseases and disability conditions.

The Physical Medicine and Rehabilitation Service of the Veterans Administration is organized along comprehensive and effective lines and has obtained positive results in the treatment, rehabilitation and resocialization of aging veteran patients. Various studies have proved that rehabilitation pays dividends in dollars as well as in social factors.

Physical medicine and rehabilitation rightfully takes its place with the other services and activities of the hospital and the community, in the common effort to make life significant and worthwhile for our aging populace. Progress to date points to many promising lines of investigation that should be explored in order to help this increasing segment of the population more effectively.

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# PATHOPHYSIOLOGIC CONSIDERATIONS IN GERIATRIC REHABILITATION

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Rehabilitation is the mobilization of physiologic, psychologic and social forces in the face of pathologic conditions, with the ultimate goal of restoration of maximum functional capacity of the handicapped, chronically ill or elderly patient.

It follows from this definition that the final outcome of medical rehabilitation hinges on the knowledge and application of both physiologic and pathologic principles. In addition to conventional therapeutic measures, medical rehabilitation makes extensive use of the inherent physical potentialities of the patient.

## Cardiovascular system

Whenever physical activity of a part of the whole human body is increased, the cardiovascular system bears the brunt of the burden. The functional reserves of the CV system of the elderly patient are naturally diminished; consequently a delicate balance between the diminished reserve and the intensified therapeutic activities must be maintained during the entire course of rehabilitation treatment. Most therapeutic measures used in rehabilitation consist of systematic activation of certain muscles or muscle groups. It is a fundamental physiologic fact that the number of active capillaries in the activated muscle increases about 30 to 45 per cent (1). Obviously, to provide for such increased demand, the heart and the systemic circulation have to function more intensively. Oxygen consumption, which is about 250 cc. per minute in the resting body, may increase under strenuous exercise to as much as 4,000 cc. Although such strenuous exercise is usually not applied in clinical practice, it is safe to assume that an average consumption of 2,000 cc. to 2,500 cc. of $O_2$ is not unusual in a rehabilitation program. To cope with this increased demand the cardiac output has to increase. This is achieved by an increase of pulse rate (facilitated by the Bainbridge reflex) and an augmentation of stroke volume through a mechanism set down in Starling's law which states that, within limits, the more the myocardial fibers stretch due to increased filling, the stronger and more efficient the systolic expulsion will be. This stepped-up myocardial activity obviously requires an increased $O_2$ supply. Even in the younger patient in whom the coronary blood flow is undisturbed, an uneconomical discrepancy exists between $O_2$ consumption and stroke volume in *strenuous* exercise. In older people, when in addition a definite impairment of coronary circulation exists, considerable care must be exercised in more strenuous physical activity. The coronary flow in most violent exercise is

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said to be 800 to 1,000 cc. per minute (2). In less intensive muscle activity it is proportionately less. This means that a remarkably large amount of blood is needed to supply the myocardium with the necessary $O_2$ and to remove metabolites. If atherosclerotic changes in the aging coronary vessels make it impossible to deliver this amount of blood, an exaggerated physical activity will cause not only the well-known "angina on effort" syndrome but it will also cut down on the cardiac output and cause anoxic difficulties in the skeletal musculature. These factors should be considered when plans for an active rehabilitation program are made for the elderly patient.

Sclerotic changes in the peripheral vessels will interfere with the blood supply of the skeletal musculature. Such changes, when advanced, may produce *intermittent claudication.* Impairment of lesser degree may only cause fatigue, necessitating modification in the rehabilitation program.

It is of practical interest to note that the widely used Buerger-Allen exercises and their modifications have recently been critically reviewed by some investigators (3). They conclude that the most effective form of exercise is that in which the muscles of the involved extremities are offered considerable resistance against contraction. Since improving the circulation in an extremity does not seem to be an easy clinical task, it is natural to look to methods which decrease the circulatory demand of the muscles involved in locomotion. According to Vernon (4) 60 liters of $O_2$ will be sufficient for 3.3 miles at a walking speed of 3 miles per hour. An increase of this speed to 5 M.P.H. will bring the performance to 2.4 miles. Hence, at 3 M.P.H. the $O_2$ consumption is 18 liters per mile, whereas at 5 M.P.H. it is 25 liters per mile. On the basis of this and other experience, Naide (4) recommended that patients suffering from intermittent claudication reduce their number of steps per minute far below the level at which complaints set in and also to shorten these steps. This regimen, in his experience, decreased the peripheral demand sufficiently to result in an improvement of the disturbing symptoms.

*Cardiac rehabilitation.* In spite of the recent revival of interest in improvement of cardiac function and reserve with the aid of physical measures, cardiac rehabilitation is still in its infancy. As such, research in this field has significant potentialities.

At present our rehabilitation efforts with cardiacs are limited to adapting the patient to the physical demands of everyday life and to working out energy-saving procedures and devices to give him maximum performance within the range of his limited cardiac capacity. This work has already produced important results, as many patients with cardiac conditions of long years' duration have been returned to partial or full employment.

The next step, the actual improvement of cardiac capacity by physical means, is a challenge to both rehabilitation and cardiology. The initial premise that the myocardium, like skeletal muscle, may be strengthened by proper exercises resulted in the introduction of Oertler's terrain therapy. In view of our present knowledge of cardiovascular physiology it is not surprising that such treatment had no therapeutic value and faded into oblivion long ago. It is sometimes

erroneously stated that the increase of cardiac output during and immediately after physical exercise may be accepted as evidence of successful cardiac rehabilitation. This is obviously incorrect. The young and healthy myocardium will naturally respond to an increased peripheral demand with increased function, but no amount of physical activity will produce a functional betterment if the myocardial structure has degenerated or the coronary circulation is impaired. On the contrary, if the initial warning signals such as dyspnea, cyanosis and persistent tachycardia are not heeded, the inevitable failure will ensue.

In making these general statements the fact that physical training can bring about very important changes in the heart and circulation of the healthy young adult has been considered. The question arises, however, whether such beneficial changes may be produced in the elderly patient with an altered cardiovascular system. The answer at present is in the negative. A goal for future research is the development of physical methods that *actually* increase the efficiency of the heart and circulation.

**Hemiplegia**

Hemiplegia is probably the most common clinical problem encountered by those interested in the physical restoration of the older patient. Except for tumors, trauma, malformation, and such, this clinical picture is the result of some form of cerebrovascular lesion. Such lesions occur primarily in middle-aged or older people who suffer pathologic changes of the cerebral vessels and/or arterial hypertension. Some of these patients do not show any signs of these conditions. Hicks and Warren (5) in a recent paper reported that in a group of 100 cerebral infarcts found at autopsy no "mechanical occlusion" of the cerebral vessels was detectable. In such cases a transient angiospasm resulting in permanent brain tissue damage was postulated as the probable cause of the cerebral lesion. In view of this, the most physiologic therapy would have been the application of certain drugs, and physical or surgical methods to produce intensive vasodilation in the cerebrovascular tree. Unfortunately, although this seems to be a physiologic procedure, it has met with little if any practical success when tried.

That the stellate ganglion mediates the vasoconstrictor impulses leading to the cerebral vessels has long been known to physiologists, but therapeutic blockage to interrupt these impulses was only recently attempted clinically. Leriche and Fontaine's paper (6) of 1936, reporting favorable changes found post mortem in 2 cases of hemiplegia after stellate ganglion infiltration, remained unnoticed for some time. Other writers like Mackey and Scott (7), Risteen and Volpitto (8), and Furmanski (9) reported rather favorable immediate results in early acute, nonhemorrhagic cerebrovascular accidents, but long-range results were not sufficiently encouraging to accept such blockage as a routine therapeutic procedure. The British writers believe that older patients with advanced arteriosclerotic changes in the cerebral vessels are not suitable candidates for such treatment.

Therapeutic attempts with dihydroergoconine, histamine, nicotinic acid and similar drugs, to hasten recovery and diminish the extent of peripheral paralysis

caused by cerebrovascular accident, also remain unsuccessful (10). In spite of the apparently sound physiologic bases of these studies, none of these methods has found its use as a routine therapeutic measure in everyday clinical practice.

Bourguignon's attempts to reverse hemiplegia even of long years' duration should be mentioned. He described a method of giving calcium by "transcerebral iontophoresis" (11). Results were as dubious as the physiologic consideration on which the therapy was based.

In evaluating the dramatic immediate results following the foregoing therapeutic measures proper consideration should be given to the existence of the clinical entity, "transient cerebral paralysis" or "chronic hypertensive encephalopathy." In spite of repeated studies by Traube, Volhard, McAlpin, Oppenheimer and Fishberg, and many others, this condition does not seem to be clearly understood. It seems most likely that it is a cerebral vasospasm of transient nature, with a tendency to spontaneous resolution before permanent brain damage sets in. Pickering, however, denies the existence of angiospasm and postulates an organic occlusion as a cause for transient paralysis (12).

Present-day rehabilitation therapy of the hemiplegic is based on sound physiologic considerations. Early mobilization prevents the addition of disuse atrophy to the existing motor paralysis, and aids the systemic circulation by maintaining the active skeletal muscles. A persistent application of active and passive movements prevents the development of deforming contractures.

### Osteoarthritis

The degenerative changes of joint cartilage, causing osteoarthritis, are by no means specific to old age but beyond any dispute they are more prevalent in the old than in the young.

The cartilage together with the cornea, lens, eardrum, and the intima and endocardium belong to the so-called *bradytrophic tissues* (Burger and Muller) (13). These tissues have a very low metabolic activity and their functional decline is slow and gradual. Their common characteristic is a very sparse or altogether absent capillary circulation. Having only a poor blood supply or none at all of their own, they are entirely dependent for nutrition and metabolite removal on the circulation of the surrounding tissues. Obviously any interference with this circulation will leave its marks on the integrity of the cartilages. In addition to these etiologic factors, the cartilage of the old patient, poorly nourished as it is, is more vulnerable to minor traumata and even to conventional therapeutic exercises than is the younger joint structure. This should serve as a warning in clinical practice, for it is often heard that the degenerated joint can be more energetically mobilized than the inflamed one since there is no danger of reactivation of the inflammatory process. This is true, but it is also true that the irreversible destruction of degenerated cartilage may at times be more dangerous than a temporary inflammatory flare-up.

The impairment of nutrition of the joint cartilage due to gradually progressing circulatory changes is only one aspect of this problem. Equally important is the progressive dehydration of the cartilaginous tissue, which contributes to its

vulnerability. The dehydration of the intervertebral cartilages causes a narrowing of the intervertebral spaces. This results in many of the well known clinical manifestations, including a gradual decrease of body height, as shown in Quetlet's table:

*Average Body Height*

| *Age (yrs.)* | *Men* | *Women* |
|---|---|---|
| 40 | 1.68 | 1.58 |
| 50 | 1.67 | 1.54 |
| 60 | 1.64 | 1.52 |
| 70 | 1.62 | 1.51 |
| 80 | 1.61 | 1.51 |
| 90 | 1.61 | 1.50 |

Since the permanent restoration and "rehydration" of the intervertebral cartilages is beyond our power, we have to be satisfied, at least for the time being, with the clinical practice of applying traction in the hope that while it is being applied the intervertebral spaces will become slightly wider and at least a temporary improvement will ensue. Although the therapeutic results with this type of management in the cervical arthropathies are encouraging, we cannot say—*post hoc ergo propter hoc*—that the narrowing of the intervertebral spaces is the only factor in the production of this condition.

**Locomotor system**

Steinbrocker and his associates (14) introduced a new clinical entity called "musculo-skeletal inadequacy in the aged." This was usually observed as an end-stage of osteoarthritis but some of the elderly patients had no underlying disease and the progressive failure seemed to be of idiopathic nature. In its advanced stage many of these patients become bedridden with a condition which Thomson termed "senile myasthenia" (15). Pathologically this is a combination of poorly identified joint and muscle lesions. A rehabilitation program for a patient with this condition should aim at progressive strengthening of the skeletal musculature. Progressive resistive exercises, if carefully planned, best serve this purpose. Obviously, no amount of exercise therapy will restore the function of muscle fibers that have already undergone degenerative changes (resulting in "brown atrophy") but exercise will strengthen the muscle fibers impaired by disuse only. Use, instead of disuse, will substantially improve the general muscle tone and function, and thus serve as an important tool in correcting generalized "muscle weakness."

Another common yet frequently overlooked clinical picture is the senile gait disability, sometimes erroneously referred to as "senile paraplegia." This term covers a wide variety of conditions, all of which have one factor in common, namely, a more or less pronounced alteration of the normal gait pattern without any easily identifiable lesion of the nervous or muscular system. Studies by Petren, Malaise, Lhermitte and Critchley (16) have not led to substantial increases in our knowledge of this disorder.

Rehabilitation relies a great deal on systematic graded purposeful exercises,

which in want of a better term are referred to as therapeutic exercises, in the treatment of senile gait and other impairments of the locomotor system. In prescribing such therapeutic physical activities the physician must be fully acquainted with their physiologic bases. A random and empirical application of exercises is often useless or harmful, especially in the higher-age groups. If the therapeutic aim is an improvement of skill, repetitive exercises will serve, and the amount of weight (or resistance) applied will be of secondary importance. If, however, the goal is to increase muscular strength or to overcome disuse atrophy, the amount of exercise weight (or resistance) will be of primary significance. It is a common misconception that exercises involving weight in any amount will improve "muscle strength." For instance, if a muscle is capable of performing 2,000 KGM of work without difficulty, exercises with this amount of work load will be of little if any strengthening value; but if one adds only 100 KGM, the additional load will serve to strengthen the muscle. Thus, the "exercise value" of a muscle-strengthening exercise is not expressed by the total work load but rather by the excess over and above the patient's usual capacity—in this case 100 KGM. Only physiologic knowledge together with clinical experience will teach the physician how far he can go in increasing the work load in order to derive the most benefit from exercises and still avoid cardiovascular and other complications.

## SUMMARY

An attempt has been made to give the pathophysiologic foundations of some of the most frequently encountered problems in rehabilitation, and to demonstrate that the methods employed in rehabilitation are not merely empirical but rest on sound pathophysiologic principles.

The great number of still unsolved clinical and experimental problems in this field present unbounded possibilities for the clinical investigator.

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# EMPHYSEMA AND THE SENILE LUNG

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The true nature of pulmonary emphysema is today as much of a problem as it has been ever since Laennec first described the condition. Recently a revival of interest has occurred but almost exclusively from the standpoint of so-called obstructive emphysema. As far as we are aware there has been little attempt to approach the problem from the point of view of so-called senile emphysema; yet, it should be obvious that the study of its nonobstructive (senile) form also affords a proper avenue of approach to the understanding of the nature and origin of emphysema.

In recent publications (1) we have discussed the primary role of "developmental defects" and that of "acquired (pathologic) defects" in the origin of emphysema of hypertrophic nature, and the factors which make for its obstructive character. At this time it is our intention to discuss the role of the "involutional defect" in the origin of atrophic (senile) emphysema, and the factors determining the character of the latter. Analysis of the nature of the "senile lung" will be shown to contribute valuable information to the understanding of the nature of emphysema. It will also be shown that the factors involved in "senile emphysema" fit in well with our concept of the nature and origins of emphysema in general.

## 1. Historical review

Senile emphysema is one of those medical concepts passed on from one textbook to the next and from one generation to the next, the origins of which become increasingly obscure with the passage of time. In his original description of emphysema Laennec did not include senile emphysema. He gave a classic description of the lungs of the aged which is well worth repeating: "In very old persons the lungs present some remarkable characters. The calibre of all their vessels seems diminished, they become in some sort exsanguine, the partitions of their air cells appear thinner than natural, on which account their substance, rendered more rare, becomes less elastic, and thus yielding to the atmospheric pressure on opening of the body, they are found to occupy not more than one-third of the cavity of the pleura. They may be said to bear the same relation to the lungs of an adult, that muslin bears to a finer cloth, which is of a texture at once strong and close. These characters are especially observable in the lungs of octogenarians"(2).

Laennec put this description of the senile lung where it truly belongs—in the opening chapter of his book in which he discussed the structures of the lungs. He did not mention it in connection with emphysema and he did not regard the senile lung as a form of the disease. It was probably Jenner who first used the

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term emphysema as applied to the senile lung and described it as "small lunged emphysema," presumed to be due to senile atrophy. In the period following Jenner, the tendency to identify the senile lung with emphysema continued to increase, although there is evidence that some clinicians were not happy with this trend. One generation later, Osler (3) wrote as if he were apologizing for including it with emphysema. He emphasized that "senile emphysema scarcely constitutes a special affection" and that "it occurs only in withered looking old persons as a senile change." Landis (4) was even more outspoken: "In the strict sense of the word this is not a true emphysema at all . . . . it is but one of the atrophic changes commonly met with in the aged." However, eventually the pendulum swung into the direction of identifying emphysema more and more with old age and associated changes in the bony cage of the chest and in the lungs (5). Finally, recent realization of the fact that emphysema occurs too frequently in young patients, led to the cleavage between presenile obstructive, and senile nonobstructive emphysema. It should be noted at this point that although both clinicians (6) and pathologists (7) insist that senile emphysema is not strictly speaking a pulmonary lesion, but is primarily a chest condition, they continue to list it as a special form of emphysema.

**2. Clinicopathologic picture**

The present status of the clinicopathologic concept of senile emphysema is, to say the least, confusing. It is fair to state that prevailing concepts may be summarized in three generally accepted beliefs:

a. In all aging individuals, more or less marked emphysema develops.

b. A high proportion of the aged suffer from clinically significant emphysema.

c. In the aged, emphysema is predominantly of the nonobstructive senile type.

When we look for support of these views in actual clinical and pathologic experience we find confusion so astounding that only a series of quotations such as the following will afford an adequate picture of the present status.

The prevalence and the clinical significance of emphysema in the aged are stressed by both clinicians and pathologists. Amberson (8) states: "Practically all ageing people develop some degree of pulmonary emphysema and frequently there are changes such as pulmonary fibrosis, chronic adhesive pleurisy, and chronic bronchitis. Dyspnea is the most common symptom and is the mechanism whereby ventilation of the lungs is maintained as nearly as possible at normal levels. It is the cause of the physical limitation and tendency to fatigue which these people experience. If ventilation of the lungs and gas exchange cannot be maintained at the physiological level, chronic anoxia results. This aggravates the symptoms mentioned and may result in irritability, weakness, anorexia and impairment in general tone and nutrition. Susceptibility to respiratory infection is greater in the emphysematous than in healthy people." In most textbooks on geriatrics these concepts are confirmed. For example Mueller-Deham writes "In all old people emphysema is one of the chief agents in lowered physical capacity and the deterioration of the latter is in direct ratio to the severity of the emphysema."(9).

Among recent pathologic studies, one that is quoted particularly often (Schlesinger (10)) indicates that in 666 autopsies on aged patients there was evidence of marked emphysema in one-third, and definite evidence of some emphysema in fully one-half. Schlesinger also emphasized the fact that, in his experience, emphysema of the aged includes hypertrophic and atrophic emphysema in about equal proportions.

In the recent geriatric literature there is a more detailed statistical report on the morbid anatomy of old age by Howell (11), who summed up his findings in the statement: "Most elderly patients show emphysema. Over the age of 80 the atrophic variety is commoner; below this hypertrophic emphysema is usual. At 60 atrophic emphysema is rare." However, it is also clear from Howell's text that the clinical significance of emphysema is not at all commensurate with this high incidence as an autopsy finding. In not a single case (in nearly 3,000 autopsies) was emphysema considered to be the direct cause of death. In Howell's analysis of the causes of death in old age the respiratory tract is listed in the third place, with 12 per cent of the total mortality. In the detailed explanation he lists bronchopneumonia and chronic bronchitis as the most common fatal pulmonary diseases. Emphysema is not included among the respiratory causes of death in old age. It is also obvious from the text of Howell that his statement that "most elderly patients show emphysema" refers merely to "the study of the texture of the lungs" and not to actual clinicopathologic conditions (11).

Perhaps it was the same sort of experience that led Mueller-Deham to state: "Senile emphysema is a chronic ailment, but it is seldom the direct cause of death, which is most often due to pulmonary conditions complicating emphysema or to cardiac failure. Emphysema illustrates excellently how an affection which is so significant in life and contributes vastly to death may be inadequately represented in statistics." (9).

The accuracy of this observation can be determined only from a correlated clinical and pathologic study of a large number of patients, such as has become available recently in the work of Monroe, who assembled the experience of thirty years at Peter Bent Brigham Hospital (12). In his clinical and pathologic study of 7,941 individuals over 61 years of age, Monroe has the following to say about emphysema: "Pulmonary emphysema was listed officially in 797 cases or 10 per cent of the P.B.B.H. group. There were three times as many men as women—610 men, or 14.9 per cent, and 187 women, or 4.8 per cent. Advancing age increased the frequency of the affection, for 8 per cent (289 cases) of the patients aged 61–65 had it; 9.4 per cent (216 cases) of those aged 66–70; 12.1 per cent (157 cases) of those aged 71–75; 14.7 per cent (81 cases) of those aged 76–80; 22.5 per cent (43 cases) of those aged 81–85; and 20.0 per cent (11 cases) of those who were over 85 years of age."

"It seems clear that the house officers in the Peter Bent Brigham Hospital have been alert in their search for emphysema and that the senior staff members have often agreed with them. So it was quite startling to find that there is almost complete disagreement between our clinicians and our pathologists on the subject. Of the 129 autopsies done on this group, the clinical diagnosis of emphysema

was omitted from the pathologic summary, or stated to be insignificant, in 110 cases, or 85 per cent. In 11 per cent (14 cases) advanced emphysema was found post mortem but the clinical diagnosis had not been made and there was no record of dyspnea. In only 4 per cent (5 cases) did the ante mortem and post mortem diagnoses agree, and in none of them did emphysema contribute to death. *Is emphysema a clinical concept only?* And do the tissue changes have much to do with the symptoms?"

"A close study of the records showed that there were at least five kinds of cases of emphysema."

"The largest group of patients comprised those with heart disease, 65 per cent."

"A second kind of pathologically unconfirmed emphysema is pulmonary infarction."

"A third kind of clinical emphysema was produced by marked hyperthyroidism."

"A large group (20 per cent) had acute or chronic infections of the upper respiratory tract. These were usually labelled 'chronic bronchitis with emphysema or asthmatic bronchitis with emphysema.'

"Finally an important cause of breathlessness during and shortly after effort is merely physical unfitness. It is difficult to guess its frequency in this group from hospital records, but the experience of the geriatric clinic and of practice outside the hospital is that it is common."

"The hospital histories were not written by geriatricians, but I think that it is fair to assert that some dyspnea called emphysema was due to the cachexia of cancer (100 cases), to cirrhosis of the liver (18 cases), to severe anemia (25 cases), to marked obesity (76 cases), to extreme kyphoscoliosis (10 cases), to malnutrition (50 cases), and the psychoneuroses and reactive depressions (166 cases). Emphysema as a clinical entity appears to be about as rare in old age as it is at other ages." (12).

If it appears from the foregoing that the clinical and pathologic significance of emphysema in old age is a subject of deep controversy, it is also a fact that the concept of senile lung changes leading to emphysema is now altogether doubted. As pointed out before, Laennec failed to identify the senile lung with emphysema, presumably because grossly they appear so much unlike one another. *Senile lungs differ from emphysematous lungs in practically every essential gross feature.* Senile lungs are small in volume and darkish in color; they feel spongy and show excessive retraction, tending to collapse. Emphysematous lungs are voluminous, and pale; they feel doughy, resist compression, fail to retract, and even tend to overexpand. This sharp contrast in gross appearance led pathologists to predicate both atrophic and hypertrophic emphysema, with totally different concepts of their pathogenesis.

Pathologists eventually realized that the most important changes in emphysema are not those in the gross appearance of the lungs as a whole, and that the essential lesion lies in the loss of minute airspaces. By now it has become a well established fact that with regard to the changes in the airspaces there is no

difference between emphysema in the young and in the old. The *essential lesion of emphysema at any age is disappearance of partitions between the airspaces, resulting in their progressive coalescence.* Pathologists have also come to accept the concept that *atrophy of the tissue elements involved in airspace partitioning is the basic process in emphysema at any age.*

In hypertrophic emphysema, *stretch-atrophy* offered itself as the most plausible explanation. This led to the assumption of obstructive hyperinflation of the airspaces due to an obstructive bronchial process. Thus the latter came to be looked upon as the primary lesion in emphysema of the young and middle aged.

In so-called "senile emphysema," the atrophy of lung tissue has always been considered a manifestation of senescence. More recently, however, the accepted concept is that this emphysema is also a matter of stretch-atrophy, that postural changes in old age lead to fixation of the bony cage of the chest in the overdistended position (barrel chest), and that this leads to overstretching of the airspaces in the lungs. Senile atrophy of the lungs, which has so long played such a prominent role in pathogenetic concepts of emphysema, has more or less receded into the background, although it is still mentioned. In current texts, the terms senile and postural emphysema have become practically interchangeable, and the role attributed to senile involution in the emphysema of old age has become greatly confused.

Even from this short review of current literature it should be fairly obvious that emphysema in old age presents just as many problems as does emphysema in earlier years. *Some of the practical problems* may be listed as follows:

1. Pulmonary emphysema appears to be uncommon as a clinically significant disease of old age; yet clinical features of emphysema (symptoms and signs) are frequently discernible in the lungs of the aged.

2. Pulmonary emphysema is never the cause of death and even appears to be uncommon as the significant pathologic condition in patients dying in old age, yet structural changes of emphysema are discernible in a very high proportion of the lungs of aged at necropsy.

3. Pulmonary emphysema in old age appears to be associated not only with affections of the lungs themselves but even more often with nonpulmonary conditions of old age.

4. The essential structural lesion of emphysema is the same at any age but, grossly, emphysema appears very different in the lungs of the young and middle aged from that in the lungs of the aged.

5. In hypertrophic emphysema, hyperinflation due to bronchial obstruction, and overdistention due to lack of elastic recoil, play predominant roles. These factors become less important with advancing age. Senile emphysema is predominantly atrophic in nature.

These are some of the problems which have arisen because of prevailing ideas about emphysema in old age, as revealed by current experience. They point to the need for a revision of our thinking.

In previous publications we have presented a new concept of the nature and origin of pulmonary emphysema, and have discussed both the role of develop-

mental defects in emphysema of early life and the role of acquired (pathologic) defects in emphysema of middle life. Emphysema in old age may be logically explained on the same basis, namely, on the role played by the "involutional lung defect." It can be shown that in the senile lung the natural process of involution associated with old age results in a "lung defect," which is in its essential nature identical with the developmental and with the acquired defects of early and middle life, respectively. This "involutional lung defect" plays the same role in the origin of emphysema in old age. The changed circumstances bring about features of emphysema by which the senile type differs from that of earlier age periods, as described previously.

Analysis of the "involutional lung defect" and of the changed circumstances which make for senile emphysema should afford a logical answer to the questions raised.

### 3. The involutional lung defect

The current concept of senile emphysema is based on identification of senile lung changes with those of emphysema, because of the similarity of the microscopic picture in both. It is still doubtful whether this identification is justified. Indeed it is a fundamental question of biology whether senescent changes should be looked upon as physiologic or as pathologic in nature. It has been stated as a guiding principle of modern geriatrics (13) that senescence is a physiologic state, like that of childhood, and that disease is complicated in old age by the normal process of degeneration. From the theoretical point of view Laennec was therefore right in looking upon the senile lung as the normal state of the organ in the aged rather than as a pathologic condition in the sense of a disease. Laennec also emphasized the fact that the condition is usually seen only in octogenarians. This observation was recently confirmed by Howell, who reported that atrophic emphysema is rare at 60, but is prevalent at 80. Presumably it increases progressively in the intervening years.

The question of the practical differentiation of the senile lung from emphysema naturally arises. It has been repeatedly emphasized (13) that "none of the structural changes observed in ageing are peculiar to that state." It is also a well established fact that the characteristic structural changes of senescence and many of the changes subsequent to injury or disease are so much alike that distinction between them is often impossible. This is particularly true in the case of emphysema of the lungs, in which condition senescent and pathologic changes appear more alike than in any other organ. Indeed the morphologic identity of emphysema and senile lung has led pathologists (7) to postulate that their pathogenesis should be identical. This has led to the theory that the senile lung, like emphysema in earlier life, is the result of long-continued strain (wear and tear) upon the tissue elements which act in the distention and in the elastic recoil of the organ. This is essentially a functional concept of the origin of the senile lung, relating it to abuse of the structures engaged in ventilatory function. However, as stated previously, failure of elastic recoil is not a characteristic feature.

It would be hard to find a more apt description of the senile lung than that offered by Laennec, who said "it compares with the lungs of the young like muslin does with fine cloth of strong close texture." The implication is clearly that there occurs a great loss of lung tissue. We know now that this refers to tissue bearing the most vital function of the lungs, namely, the alveolar septa which serve in the partitioning of the airspaces. Their disappearance makes for coalescence of airspaces and results in progressive loss of breathing surface. Thus the process of natural involution associated with senescence leads to a structural "lung defect" which directly and profoundly affects the capacity of the lungs as a whole to create breathing surface.

Recent physiologic studies (14) have shown that it is possible to estimate the extent of this loss of function in the senescent lung by measuring *the total diffusing capacity* utilized in maximal exertion. It is known that the total diffusing capacity of the lungs is greatly decreased in old age and may be reduced to half of the average level in young individuals. Furthermore, observations indicate that, even in middle age, total diffusing capacity of the lungs continues to decrease progressively. Since diffusing capacity is entirely a matter of breathing surface, it is reasonable to assume that senescence involves the progressive loss of this function and that most of the breathing surface reserve is lost with advancing years.

Thus by the structural features of the senile lung as well as by the findings in modern functional studies on aging lungs, we are led to conclude that *the function implicated in the "involutional lung defect" is decrease in breathing surface rather than failure of elastic recoil.* This eliminates wear and tear of elastic structures as the main factor in the pathogenesis of senile lungs. Loss of reserve breathing surface becomes the conspicuous feature to be explained. This is closely linked with progressive decline in physical activity with advancing age. Physical exertions are totally dependent on pulmonary reserve capacity, which is individually very variable but normally very large even when capacity is modest. There is much evidence to indicate that constant use and training is needed to maintain the pulmonary reserve at peak capacity, even under normal conditions in young individuals. Loss of this reserve by disuse is also indicated by much practical experience. These considerations lead us to assume that functional disuse is the most potent factor in the pathogenesis of the senile lung. Its onset is therefore individually very variable. It may be absent even in octogenarians, if they are accustomed to physical exertions.

Atrophy of disuse has long been a well recognized biologic fact. We are therefore led to the conclusion that the *"involutional lung defect" is the result of progressive disuse of the organ, and hence is functional in its origin as well as in its nature.* In the case of the lungs, the particular significance of this conclusion is that it points to creation of breathing surface as the true visceral function of the lungs, a concept long advocated by one of us (15).

The functional origin of the "involutional lung defect" appears to be supported also by the fact that there are indications for insufficiency of function in the senile lungs more than in the other senile organs, for example, the kidney.

In senescence, although some units in the kidneys cease to function, enough active nephrons remain so that there is seldom clinical evidence of renal insufficiency (16). Insufficiency is presumably prevented by adequate reserves for compensatory hyperfunction in case of need. In contrast, with senescence, *pulmonary function becomes impaired, as shown by a progressive decrease in the total diffusing capacity of the lungs.* No reserves are available for compensatory hyperfunction to maintain normal diffusing capacity. In senile lungs the only compensatory hyperfunction feasible is increased ventilation, which is not in the strict sense a function of the lungs themselves, but rather of the chest and diaphragms.

In the light of the foregoing, it would appear that the involutional lung defect differs from previously discussed lung defects (17) in two essential points: 1) It owes its origin to functional disuse rather than to failing growth (developmental defects) or to pathologic destruction (acquired defects) of lung structures. 2) It involves the lungs as a whole, with progressive loss of reserves precluding compensatory capacity in case of need for increased function. Developmental and acquired defects are either limited or localized and can be compensated for by available reserves, at least to some extent and for some period of time.

These features of the involutional lung defect can account for some of the obvious differences between emphysema in earlier years and in old age, which have led to the division into the two types, *i.e.*, hypertrophic obstructive and atrophic nonobstructive. The most conspicuous differences between them are the increased lung volume, loss of elastic recoil, tendency toward obstruction, and disturbed ventilation in the hypertrophic obstructive type, compared to the tendency to decreased lung volume, the normal elastic recoil, and the clear air passages in the atrophic nonobstructive type. In the latter the only disturbed function is that of diffusion of gases across the breathing surface, which decreases progressively.

Decreased lung volume in senile emphysema may be logically explained by a loss of reserves, which precludes compensatory hyperfunction. In previous publications (18) we have pointed out that increased lung volume in hypertrophic emphysema is to a great extent accounted for by "functional emphysema" due to compensatory function of all available airspaces in the lungs ordinarily held in reserve against the need for increased function. Emphysema in old age becomes increasingly atrophic. As observed by Howell, it is predominantly atrophic at the age of 80 and above; but it is increasingly more hypertrophic as we go backward to the age of 60, when atrophic emphysema is rare. If emphysema develops before the late seventies, the younger the patients the more apt the emphysema is to be hypertrophic. With advancing years progression of the involutional defect throughout the lungs, with loss of reserves, precludes an increase of lung volume in spite of the forces of overdistention, which operate in the emphysema of old age just as they do in the emphysema of earlier years.

The forces operating to distend the lungs are the same in emphysema at any age. In a preceding publication we discussed these in relation to the hypertrophic type (17). We pointed out that the most important of these forces is *overdistention* of the airspaces lacking elastic recoil. *Hyperinflation* of airspaces due to bronchial

obstruction is only of secondary importance. Overdistention involves the lungs as a whole. It operates by overstretching the defective airspaces, which cannot take up the stretch because of loss of structure involved in airspace partitioning. The force of overdistention is of course thoracic traction. In hypertrophic emphysema at any age, thoracic traction is increased due to the effort of compensatory hyperfunction (dyspnea). In atrophic emphysema increased thoracic traction is exerted in part by fixation of the chest in the inspiratory position, as a result of senile changes in the bony skeleton. This is more marked in some cases than in others. Hyperinflation of airspaces following bronchial obstruction often becomes a prominent feature in hypertrophic emphysema, in which it plays a role in localized bullous changes. In atrophic emphysema, with increasing loss of structures the overdistending force is exerted also on the bronchi; this tends to keep the bronchi patent in spite of their frequent involvement. In atrophic emphysema, elastic recoil is insufficient to contract the lungs *in vivo*. Overdistention, however, never reaches the point of no return, as upon opening of the chest the lungs are observed to retract to their much reduced volume caused by loss of tissue.

### 4. Comment

Since so many elderly patients have cardiovascular disease, digitalis and mercurials have proved to be useful aids in the treatment of emphysema in this age group. If complicated by pulmonary emphysema, the treatment of the associated conditions, such as bronchial infection, plays the predominant role in therapy.


## SUMMARY

The pathogenetic history of emphysema in old age, emerging from the concepts presented here, may be outlined as follows:

With advancing age, decreasing physical activity and progressive functional disuse of the lungs results in declining capacity of lung function. The morphologic expression of this is the senile lung, characterized by decreased partitioning of airspaces, loss of alveolar septa, coalescence of alveoli, and a decrease in tissue and volume of the organ in proportion to the extent of involution which has occurred in the individual with age.

This natural process of involution, affecting all the aged, results in the "involutional lung defect." The essential nature of this condition is identical with that of the "developmental lung defect" due to failure of growth, and with that of the "acquired pathologic lung defect" due to destruction of lung tissue. Just as the latter conditions create a predisposition to emphysema in the young and in the middle aged, respectively, so does the "involutional lung defect" create a predisposition to emphysema in old age. This increases in frequency and in extent from the age of 60 on, and becomes an almost constant finding in persons over 80 years of age.

The individually variable progress of involution which determines the development of emphysema, its type and its rate of development, depends upon the

rate of decline in physical activity and disuse of the lungs. The average rate of involution predisposes to predominantly hypertrophic emphysema from the early sixties to the late seventies, and to predominantly atrophic emphysema after that age.

The involutional defect develops into emphysematous changes only upon intervention of the mechanical forces leading to overdistention. In most aged subjects the chief factor producing pulmonary overdistention is pulmonary insufficiency (dyspnea). Senile changes in the bony skeleton of the chest leading to fixation (barrel chest) and to ventilatory insufficiency become the chief factor in only a minority of cases.

In elderly patients symptoms and signs of emphysema often signify mere functional involvement of lungs afflicted by progressive involutional defect; the clinically significant disease may be entirely outside the lungs. At necropsy, there may be conspicuous morphologic evidence of emphysema, even though the clinicopathologic condition which caused death is outside the lungs.

## CONCLUSIONS

The following practical conclusions may be drawn with regard to the clinicopathologic aspects of emphysema in old age:

As a distinct clinicopathologic entity, pulmonary emphysema is usually not acquired during old age. Patients with emphysema previously acquired often survive into old age without obvious changes in the clinical or morphologic features to indicate transition from presenile to senile emphysema. Symptoms and signs of emphysema are often associated with nonpulmonary conditions. The tendency to overestimate the clinicopathologic significance of the symptoms and signs of emphysema often leads to overlooking the primary disease outside the lungs. The most frequent cause of dyspnea in the aged giving rise to symptoms and signs of emphysema is cardiovascular disease.

Pulmonary emphysema and bronchitis often represent pulmonary complications of cardiovascular or other extrapulmonary diseases implicating the function of the lungs and chest.

Practical experience has led to the use of digitalis and of mercurials in the treatment of elderly emphysematous patients. This is purposeful therapy, in view of the high incidence of cardiovascular disease in this age-group. Treatment of the complicating pulmonary emphysema is a matter of combating bronchial infection and preventing sequelae; under these circumstances it plays an even more important role than treatment of the emphysema itself.

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# AN INTRODUCTION TO GERIATRICS FOR SENIOR MEDICAL STUDENTS DURING THEIR OUT-PATIENT ASSIGNMENT

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There is increasing interest in geriatrics, and its scope and fund of special information has widened considerably. Its final role in medicine is not known, yet its importance is being acknowledged, and there is growing agreement that the experienced geriatrician often can offer much that will benefit the aged patient. Since a great deal of this experience has been recorded, the author concerned himself with a plan to offer medical students some of the information concerned.

A syllabus for an introduction to geriatrics was drawn up without too much difficulty, but obstacles arose when the question of including the course in the clinical curriculum was considered. At first, thought was given to the possibility of making it an elective subject; on the other hand, if it were worth presenting at all, it seemed reasonable to offer it to an entire class. The problem was solved by combining the course with a special geriatric clinic, which was included in the assignment to the out-patient department as part of the curriculum of the senior year. The syllabus presented here is based on the experience with this special geriatric clinic.

The course may be given to all of a class at one time, but it lends itself best to informal discussion with small groups. It is suggested that a two-hour clinic be established and held in the conference room of an out-patient department. Approximately 25 students should be assigned to this clinic at one time, to attend once a week for six sessions. In other words, twelve hours are devoted to covering the syllabus.

The discussions at all sessions should center about the geriatrician in charge, but it would be well if he called upon others in related fields to assist him in the first, fifth and sixth sessions.

The first session is used to introduce the students to geriatrics and to outline its scope and present status as a division of medicine. Since geriatrics includes dealing with the ever-present economic and social problems, an experienced medical social worker may contribute to the part of the discussion concerned with the non-medical problems resulting from the increase in the old-age population. Moreover, a medical social worker should be in a good position to present a case for study depicting the importance of the socio-economic problems and discuss how social agencies operate in assisting physicians in caring for their aged patients.

Since the second, third and fourth sessions deal only with medical topics, the geriatrician might decide to deal with them himself. In these sessions, the aging process is analyzed, suggestions are made for the handling of the problems that

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may arise during the examination of the aged patient, the practical advantage of correlated diagnoses is emphasized, and special aspects of the chronic and degenerative diseases and medical care are discussed.

If an anesthetist and a surgeon join the geriatrician for the fifth session, when geriatric surgery is up for discussion, personal experience makes the presentation more vivid. In fact, it would be desirable for the geriatrician to remain in the background at this time, leaving the conducting of the class to his guests. However, the moderator, whoever he may be, should guide the discussion to show how cooperation between the anesthetist, surgeon and geriatrician can further the care of the aged surgical patient.

A physiotherapist is the logical guest for the sixth session, and a psychiatrist also might be included. The topic of this session is planning in geriatrics. There should be emphasis on the maintenance of optimal physical health. This is the province of the geriatrician, but since both mental and physical rehabilitation are often involved in planning for the aged sick, a psychiatrist and physiotherapist can contribute a great deal to the discussion. Here again is evidence that cooperation between different branches of medicine means better care of the sick.

Other plans for introducing medical students to geriatrics, perhaps better ones, will occur to other physicians who work with the aged and who teach in our medical schools. The plan offered here, based on our experience, may serve as a suggestion.

## SYLLABUS

### *An Introduction to Geriatrics for Senior Medical Students During Their Out-Patient Department Assignment*

**First session** (Geriatrician and medical social worker)

*First hour*

**I. Introduction**

- A. What is geriatrics? gerontology?
  - 1. Is geriatrics a specialty?
    - a) The possible role of a geriatric specialist
    - b) Geriatrics compared with pediatrics
  - 2. The present status of geriatrics in internal medicine
- B. The aging population
  - 1. Comparative mortality rates of the general population
  - 2. Comparative mortality rates of the degenerative diseases
  - 3. Resulting non-medical problems
    - a) Economic
      - i. Prolonged illness
      - ii. Invalidism
    - b) Social
      - i. Social agencies and how they operate
      - ii. Convalescent and nursing homes
      - iii. Old peoples' homes

*Second hour*

**Case study.** Case should depict the importance of the socio-economic problem and how a social agency has helped in the care of the patient.

**Second session** (Geriatrician)

*First hour*

**II. The aging process**

A. Theories of aging
   1. Is it a fundamental property of protoplasm?
      a) Race differences
      b) Family differences
   2. Is it the result of multiple stimuli (physical, dietary, emotional) acting on the organism?
   3. Chronologic and physiologic age
      a) The useful life and its span

B. Evidence for the theories of aging
   1. Anatomic (pathologic)
   2. Physiologic (chemical)

*Second hour*

**Case study.** Case should illustrate how anatomic and physiologic changes contribute to aging.

**Third session** (Geriatrician)

*First hour*

**III. Examination of geriatric patient**

A. The interview
   1. General data
   2. Present illness
      a) Complaints
      b) Onset and course
   3. Past history
   4. Systemic review

B. The physical examination

C. Laboratory examination
   1. Routine tests
   2. Special tests

D. The diagnosis
   1. Anatomic
   2. Physiologic
   3. Clinical (therapeutic)
   4. Socio-economic

*Second hour*

**Case study.** Case (or cases) illustrating problems encountered in examining a geriatric patient.

**Fourth session** (Geriatrician)

*First hour*

**IV. Geriatric medicine**

A. Special aspects of the chronic and degenerative diseases (*e.g.*, arteriosclerosis and its relationship to nutrition)
B. Special problems in medical care
   1. Infectious and contagious diseases
   2. Cardiovascular diseases
   3. Endocrine diseases
   4. Neuropsychiatric diseases

*Second hour*

**Case study.** Case (or cases) illustrating problems in the medical care of various diseases.

**Fifth session** (Anesthetist, geriatrician and surgeon)

*First hour*

**V. Geriatric surgery**

A. Special problems in preoperative care
B. Choice of anesthetic and anesthetic management
C. Special problems in postoperative care
D. Convalescence and early ambulation of the aged
E. Elective and emergency surgery in the aged

*Second hour*

**Case study.** Case (or cases) illustrating the management of elective and emergency surgical problems in the aged.

**Sixth session** (Geriatrician, physiotherapist and psychiatrist)

*First hour*

**VI. Planning in geriatrics**

A. Prevention of disease; physical and mental hygiene
   1. Periodic examination
   2. Nutritional problems
      a) Underweight
      b) Overweight
      c) Malnutrition
   3. Emotional problems
      a) Retirement
      b) Avocations
   4. Exercise

B. Rehabilitation
   1. Physical
   2. Mental
   3. Socio-economic

C. Life and work expectancies of physicians and planning for their old age

*Second hour*

**Case study.** Case (or cases) illustrating problems in planning for maintenance and rehabilitation of the geriatric patient.

# THE ROLE OF THE INDUSTRIAL PHYSICIAN IN THE PREVENTION OF CARDIOVASCULAR DISEASE

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The physician in industry is in a favorable position to exert a positive influence in a preventive program relative to cardiovascular disease. It is of interest that occupation and economic status play an important role in deaths due to this disease among men. Using 100 as an index of mortality for males in general—professional men, proprietors, and executives would be listed at 100; skilled workers, salesmen and clerks at 95; and semiskilled and unskilled workers at 106. Yet within the professional group, the variation would range from 76 for teachers and 92 for lawyers, to 135 for physicians. In the unskilled group the variation is also great, ranging from 68 for unskilled laborers and 110 for coal miners, to 126 for metal furnacemen.

The population of the United States is aging rapidly. In 1910, only 19 per cent of the population was 45 years or older. In 1940 this had increased to 27 per cent. By the year 2000, it is estimated that there will be 21.5 million people 65 years of age or older. Coincident with this, the incidence of cardiovascular disease is also increasing. Thus it behooves every physician to employ all of his knowledge and experience to avoid atherosclerosis in his patients and thereby increase their life span. The physician's task is made difficult, however, by the obscure etiology and often by the lack of symptoms and signs characteristic of the early stages of the disease.

Armstrong and his co-workers (1) have shown that 20 per cent of persons over age 30 are obese, and about 5,000,000 or 20 per cent of this group are "pathologically overweight." They report that life insurance statistics reveal that the death rate for men who are from 15 to 24 per cent overweight and fall in the 20–29 year age-group, is 107 per cent of the expected death rate (normal expected death rate, 100 per cent). There is a definite increase with age; for example, men in the 50–59 year age-group are listed as having a mortality of 118 per cent. It is thus evident that overweight shortens life expectancy and is an important etiologic factor in the development of coronary artery disease, hypertension, diabetes mellitus, cirrhosis of the liver and gallbladder disease.

As one would expect, the longer an individual is overweight, the poorer is the prognosis. Data from the Metropolitan Life Insurance Company indicate that the number of deaths is 33 per cent above expectancy in the first five years after examination, 52 per cent above in the period from five to fourteen years after examination, and 60 per cent above in the period from fifteen to twenty-five years after examination.

Of particular interest, is a study of the mortality from circulatory diseases in Norway from 1940 to 1945. It notes that prior to the second World War, mortality from diseases of the circulatory system was rising annually in Norway.

This rise stopped during the war; in fact, there was a definite decrease. Within a few weeks of the onset of deprivation after the conclusion of the war, there was a rapid return of the mortality to the pre-war level. These data suggest that there was a fairly close correlation between the death rate and the fat consumption per capita per annum. During the war years, there was an increase in the consumption of fish, skimmed milk, cereal, potatoes and vegetables. The average caloric intake fell from 3,470 per man per day to 2,850. Along with this, there was a considerable decrease in weight for the average individual. The caloric reduction was mainly in the fat component, which fell from 159 grams to 71 grams per day, while the consumption of carbohydrates increased from 395 to 429 grams per day.

Studies of human atherosclerosis have revealed deviations from the normal in the blood cholesterol levels, cholesterol-phospholipid ratios, and the distribution of lipoproteins. There is no clinical standard whereby one can detect early atherosclerosis. In advanced disease there is no constant chemical characteristic of the condition. Gofmann and his associates (2) have extensively studied the lipoproteins by ultra centrifugation. They indicate that the $S_F$ 10–20 lipoprotein bodies are increased in atherosclerosis, and therefore important in the pathogenesis of this disease.

We know that the type of diet is closely related to the development of atherosclerosis but its exact role is obscure. Two general types of diets have been in use for control or prevention of atherosclerosis. One is a "cholesterol-free" diet, without strict fat limitation. The other emphasizes limitation of fat, avoidance of obesity and puts no particular emphasis on restriction of cholesterol. It is known that serum cholesterol levels are not materially altered by strict elimination of cholesterol in the diet. A single large dose of cholesterol will likewise not alter the serum cholesterol level. It is known, however, that a combination of low cholesterol and low fat in the diet will lower the serum cholesterol level significantly. This combination also has been shown to reduce the $S_F$ 10–20 lipoproteins. When elevated, these lipoproteins may be instrumental in the production of atherosclerosis. When vegetable fat is added to a combination diet, the serum cholesterol returns to pre-diet levels. This is supportive evidence that cholesterol is synthesized by certain organs in the body. It would seem that observance of diet and avoidance of obesity are the most realistic ways we now have of preventing arteriosclerosis.

The industrial physician is able to detect early deviation from normal during the periodic examination of the employee, to advise him as to proper dietary habits, and to inform him of the importance of the restrictions imposed.

The industrial physician is also able to follow the patient throughout his employment and to observe him after retirement. In this manner, the field of assistance can be greatly extended. The management of the problem is shared with the patient's personal physician. Moreover, the medical department in industry can influence the menu available to employees at the various company-sponsored restaurants. This can be further augmented by educational means, such as movies, pamphlets and group discussions.

Coronary arteriosclerosis is a problem which is currently attracting much attention. Certainly, premature death due to arteriosclerosis is a major factor in lowering the life expectancy in males. Sudden death from coronary occlusion can often be anticipated by the informed physician. The high degree of rapport enjoyed by the physician in industry allows the employee to be advised about symptoms which may be early indications of coronary disease. The employee may then obtain advice on general or specific health measures which enable him to continue gainful activity and possibly avoid or postpone the day of a fatal myocardial infarction. In cases in which the employee has no presenting complaint referable to the cardiovascular system, it is not uncommon that upon examination, certain abnormalities are observed. Proper management of these abnormalities may prevent the disabling effects of cardiovascular disease. Even in clinically advanced stages of heart disease, the physician in industry cooperating with the private physician can frequently increase the usefulness and longevity of the employee.

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# USE OF A *d*-AMPHETAMINE-AMOBARBITAL COMBINATION AS AN ADJUNCT TO THE TREATMENT OF CARCINOMA

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Cancer is one of modern civilization's most ruthless killers. The slightest suspicion of it brings fear into the eyes of the middle-aged patient. When the fear is justified, when the diagnosis confirms the patient's secret forebodings, his need for mental rest is as great as his need for physical relief.

It would be absurd to speak of the psychotherapy of cancer as if one might hope to change the course of the disease with such treatment; it is not absurd, however, to speak of the psychotherapy of the cancer patient. Surely, here it is as important to treat the patient as it is the disease. Alvarez has emphasized the fact that every good physician must be, to some extent, a psychiatrist. The growing awareness of this concept is manifest in the newer postoperative technique of returning the nonterminal cancer patient to normal activity as soon as possible, thereby accelerating both healing and morale. There is a well recognized need for that common, horse-sense psychology which many general practitioners apply instinctively.

The cancer patient frequently becomes introspective, anxious and depressed. These negative mental traits impede his recovery, create added tension and worry in his family (which very often mirrors the patient's emotional unrest) and increases the difficulty of the already formidable adjustments the patient must make to life or—all too often in cancer—to death. Although it is true, at least in Philadelphia, that many physicians never mention the dreaded word "cancer" (1), this kindly evasion may not appreciably lessen the patient's anxiety. As his physical condition becomes worse, the patient's fear increases. The fact that he can't *name* the dreaded scourge ravishing his body, provides him with only fitful hope and meager solace. Obviously, any adjunct to therapy that may aid in the amelioration of the patient's brooding unrest should not be ignored.

Anxiety and depression are not symptoms peculiar to the cancer patient. They are frequent accompaniments of all illnesses. My observations with a *d*-amphetamine-amobarbital combination[1] in treating the unrelenting disquiet of the aged (2) had shown it to be very effective in producing optimism and cheerfulness without undue stimulation. This previous experience led to the assumption that the medication might prove equally beneficial in relieving the anxious depression experienced by patients suffering from carcinoma. This assumption was not unwarranted. Over a period of three and a half years I have used the *d*-amphetamine-amobarbital combination in 14 cancer patients. The medication

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[1] Manufactured as Dexamyl by Smith, Kline & French Laboratories. Tablets contain 5 mg. of *d*-amphetamine sulfate and 32 mg. of amobarbital.

was of demonstrable benefit in 11, and of marked, frequently dramatic, benefit in 5 of these patients. The following case histories illustrate the effectiveness of this therapy:

## CASE HISTORIES

### Case 1

*C. J.*, a 50-year-old woman who had suffered from severe constipation all her life, came for treatment after experiencing daily rectal bleeding for the previous four to five months. Cancer was far advanced. The entire anus, rectum, sigmoid, and part of the descending colon had to be removed. A remarkable gastroenterostomy was performed at the Woman's West Philadelphia Homeopathic Hospital, after which this patient lived for 16 months. Although the first nine months were passed without severe emotional depression, her mornings were usually quite "low." One Dexamyl tablet on arising afforded her—and her husband—great emotional relief. During the tenth month the dosage was increased to two tablets in the morning, and one at noon; then, a few weeks later, to one every three hours in addition to the two in the morning. Her last two months were marked by great emotional instability. She refused all oral medication, and hypodermic sedation had to be employed.

I have reviewed this patient's history with her husband and the nurse who cared for her during the entire bitter experience. We were all in full accord that the medication was pre-eminently successful in softening the miseries of this unhappy and unfortunate woman.

### Case 2

*S. G.*, a 33-year-old mother of three children, had received extensive radiation treatment following an operation for cancer of the pelvis. She suffered a severe radiation reaction resulting in the breakdown of several pelvic organs. Multiple fistulae formed, with resultant communication between the bladder and vagina, rectum and vagina, and rectum and pelvis. A series of operations involved the removal of her uterus, ovaries, fallopian tubes, bladder and rectum; two ureters emptied from the sigmoid to the anterior abdominal wall. The full significance of these operations meant but one thing to her—cancer. Although I tried to emancipate her from this understandable deduction, I was almost as fearful as she that it might really be the malignancy, and not the radium response, that was undermining her; and I, too, lived in a state of reflective torment lest the diagnostic conclusions proved to be in error. This patient's despair, the deepening mood, the fearful anxieties, the revolting disgust with her own unpreventable uncleanliness, all came close to breaking the thread of hope, the desire to live. Her emotional turbulence was aggravated by her unfeeling husband, a drunkard who believed that a mother and kitchen drudge should never be sick. Dexamyl greatly aided this unhappy woman to win her struggle for life.

She is now without pain, and has adjusted to her new hygiene. From one tablet of Dexamyl every four hours (and often two on arising) she reduced the dose to three, then to two tablets per day; for one month she took one tablet on arising; later, she discontinued the medication entirely. While this patient was under treatment, her older sister (who detected my own fears) said: "Doctor, I think you ought to take those pills yourself. Maybe they would help your feelings like they help hers. I never saw anything like the way they make her feel better. Don't think she'd have the nerve to go on, if she didn't have that medicine."

### Case 3

*G. V. D.*, a great-grandfather, was a fun-loving, still virile, 84-year-old man who had outlived two wives. Twelve years before, while touring Europe, he had almost married a third—a 32-year-old German Fräulein. He decided against it because "my 40-year-old sons are too senile to understand my urge." I had not seen him for three months prior to his most recent visit to my office. In that short time, death had already wrapped its shroud

about him. Gone was the smile; gone was the joy of life in his eyes. His ruddy skin had tarnished to brass green, and bony prominences proved the loss of 31 pounds. He was to live only four months longer. In these last months, there was only one medication that was able to establish a semblance of his unique humor. He took Dexamyl for over eleven weeks, in a dosage of one tablet every three hours from 8 a.m. to 5 p.m. At bedtime, a combination of chloral and sustained-release phenobarbital was used to induce sleep. "That green tablet," he said, "takes away the greenness of my skin. Three-quarters of an hour after I take that tablet, life seems worth living again."

He was convalescing rapidly from a laparotomy when suddenly, on the twelfth postoperative day, he died. An embolism was the immediate cause of death, but the postmortem examination revealed cancer of the liver, kidneys, lung, pancreas, spleen, brain and vascular system.

This patient had one of those remarkable, painless lesions; but his moroseness, depression, and anxiety were all severe. How neglectful it would have been to deprive him of the needed emotional support.

## DISCUSSION

These 3 cases illustrate the striking benefits one may sometimes expect from the administration of *d*-amphetamine-amobarbital combination. Two other patients responded equally well. All patients do not respond as quickly and dramatically; yet almost all do respond favorably. Eight of the remaining 11 patients treated during this brief study experienced a demonstrable alleviation of depression which, in addition to increasing their immediate sense of well being, made them much more responsive to other treatment. Three patients were not appreciably helped by the medication, and later discontinued treatment under my care.

It was found that in order to achieve the best response from the medication the dose had to be tailored to the individual. One or two tablets given two or three times a day was the most effective dosage for most patients; but in thin patients, and in those who responded too promptly to amphetamine it was found advisable to cut the dose in half. It is also well to administer the tablets after meals, since the medication may invite anorexia; however, in one patient suffering from breast cancer, the feeling of well being produced by the medication actually increased her appetite.

In spite of our profession's most heroic efforts, the mortality rate of cancer patients is still a very disheartening medical statistic. Of the 11 patients in this study who were followed up by the author, only 4 are now alive. However, though we may not be able to defeat death, it is of some consolation that we can at least often conquer despair. A medication that can help to achieve this victory certainly plays an important, if not indispensable, role in the treatment of cancer patients. Judging from the results of this study, it would seem that the *d*-amphetamine-amobarbital combination is such a medication.

## SUMMARY AND CONCLUSIONS

The need for relieving the anxiety and depression suffered by cancer patients has been emphasized. This paper reports results in 14 cancer patients who were treated with *d*-amphetamine-amobarbital, as an adjunct to other therapy. The dose was adjusted to the individual.

There was a dramatic response in 5 patients; a demonstrably beneficial response in 8; and little or no response in 3. Case histories are given which illustrate the beneficial effects of the medication.

It is concluded that *d*-amphetamine-amobarbital medication has an important role as adjunctive therapy in the treatment of cancer patients.

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# THE SIGNIFICANCE OF PERIODIC SIGMOIDOSCOPIC EXAMINATIONS

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It is significant that during the past half century deaths have been more and more concentrated in the older ages. In 1900 one fourth of all deaths in the United States occurred in patients aged 65 years and over. By 1950 this proportion had increased to more than one half.

To some extent this increasing concentration of deaths in patients past mid life reflects the rise in the proportion of older persons in the population. Whereas the total population of the United States doubled during the past fifty years, the number of persons between ages 45 and 64 nearly tripled and the number at ages 65 and over quadrupled. In 1900 the aged accounted for 1 in every 25 of the population. At present this ratio is 1 in every 12.

A major factor in bringing about these changes in the age at death has been the control of infectious diseases of childhood and early adult life. These include particularly the diarrheas and enteritis of children, diphtheria, scarlet fever, measles, whooping cough and the other contagious diseases so prone to occur in young patients. Tuberculosis, cardiovascular-renal diseases and heart disease of rheumatic and syphilitic origin are gradually coming under control in the younger age groups. These factors all lead toward the concentration of mortality in later life. It means that in the future the chronic diseases, particularly cardiovascular conditions, and malignant neoplasms will become increasingly important as major factors in morbidity and mortality among our patients (1).

The Metropolitan Life Insurance Company estimates (2), as of December 1953, that the death rate in the United States was 665.6 persons per 100,000 policy holders. Of this number, the death rate from cardiovascular-renal disease was 335.9, and that from malignant neoplasms 129.2. They further point out that whereas in 1910 malignant neoplasms caused 7 per cent of all deaths and were listed fifth as the principal cause of death in this country, in 1947 malignant neoplasms were causing 13 per cent of deaths and ranked next to heart disease as the principal cause of death (3).

In studying the death rates for the various types of malignancy, again this same authority reports (4), and it is generally recognized, that among males under 75 years of age from 1950 to 1951 malignant neoplasms occurred most commonly in the digestive organs, particularly the stomach; the second in frequency were those of the respiratory system, particularly the lung and mediastinum; and the third most commonly occurring malignant neoplasms were found in the intestine and rectum. In females, cancer of the genital organs was the commonest cause of death, followed by cancer of the breast and again in third place, malignant neoplasms of the intestine and rectum.

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Much progress has been made in recent years in the early detection, diagnosis and treatment of malignant disease in these locations. It must be admitted, however, that the end results of treatment of pelvic and breast cancer in women and of cancer of the stomach and lung in both sexes, leave much to be desired. There is still a great deal to be learned by all of us, physicians and patients alike, in the early detection, diagnosis and treatment of these conditions.

### MALIGNANT DISEASE OF THE COLON AND RECTUM

It is particularly gratifying to review the progress that has been made in the detection, treatment and the end results of therapy in malignant disease of the colon and rectum. Cancer in these organs tends to produce early symptoms. The public has been well educated to recognize these symptoms and to bring them to the attention of the physician. Likewise, much progress has been made in the surgical treatment of malignant disease in this location; consequently, the end results, although still subject to considerable improvement, are gratifying. At the present time, in the hands of experienced surgeons, at least 50 per cent of the patients with carcinoma of the colon or rectum survive five years.

In any analysis of the cancer problem it must be recognized that the ideal approach to malignant disease is not necessarily by means of the further development of surgical technique and the early diagnosis of cancer, but by the *prevention* of cancer.

In the development of cancer of the colon and rectum it is fortunate that in most instances the disease passes through a premalignant or benign polypoid phase. If the general population and all examining physicians are constantly aware of this, further strides can be made not only in the treatment of the early and borderline phases of malignant disease of the colon and rectum but, most importantly, in the prevention of cancer.

The percentage of cancer of the colon and rectum that arises in a pre-existing benign mucosal polyp is not known. Undoubtedly, some cases of malignant disease in these organs do not pass through a polypoid phase. However, it has been our clinical impression and the opinion of most of those who have studied this problem that in a large percentage of cases a benign mucosal polyp existed before cancer of the colon and rectum developed.

Most of our present knowledge of polyps of the rectum and colon can be summarized as follows (5): (a) Benign mucosal polyps of the rectum and colon occur in both sexes, slightly more commonly in males than in females, and at all ages. They are present with increasing frequency in the older age groups. (b) Polyps are frequently multiple and are found in approximately 25 per cent of all surgical specimens removed because of rectal or colonic cancer. (c) There is a definite relationship between the age of the patient, the location of benign mucosal polyps, and malignant disease of the colon and rectum. (d) All stages between benign mucosal polyps and carcinoma of the colon and rectum can be demonstrated histologically. (e) Benign mucosal polyps are true tumors and should be considered premalignant lesions. They are the result of some inherent

defect in cellular growth and are not the result of an inflammatory process. (f) A large percentage of malignant lesions of the colon and rectum originate in pre-existing benign mucosal polyps.

There can be no question about the intimate relationship between benign

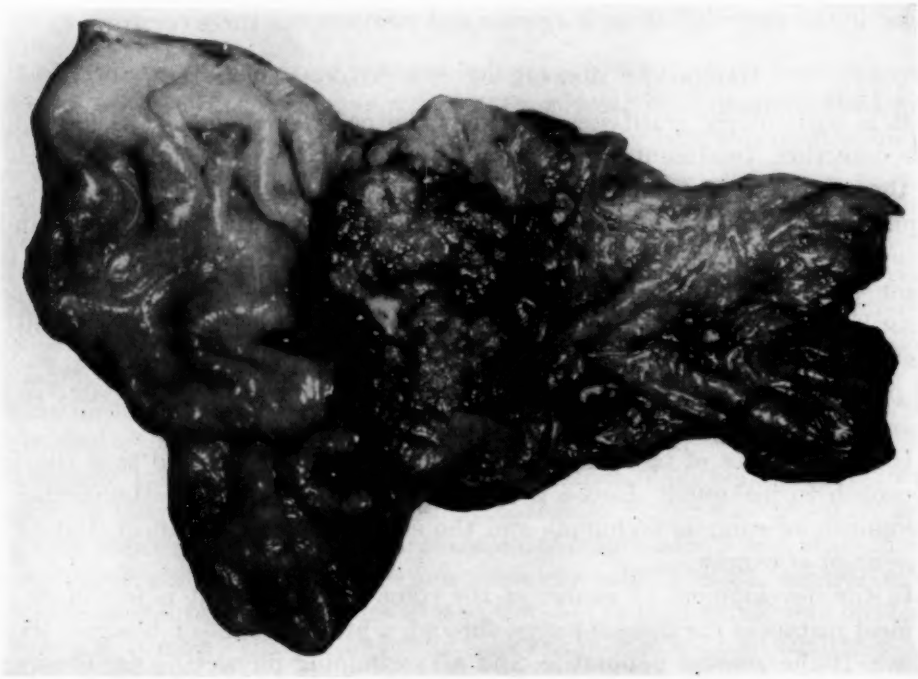

FIG. 1. Resected specimen of a rectum, showing small benign mucosal polyps of various sizes and moderately advanced adenocarcinoma. (Courtesy of The New England Journal of Medicine.) Swinton, N. W., and Doane, W. A.: Significance and treatment of polyps of the colon and rectum, *New England J. Med.* **249**: 673–678 (Oct. 22) 1953.

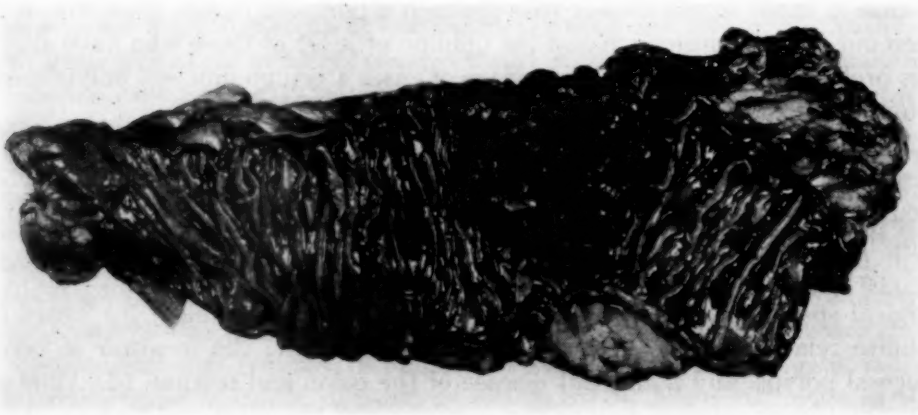

FIG. 2. A papillary adenoma or villous type tumor of the transverse colon. Such tumors tend to spread laterally and are prone to recur unless resected.

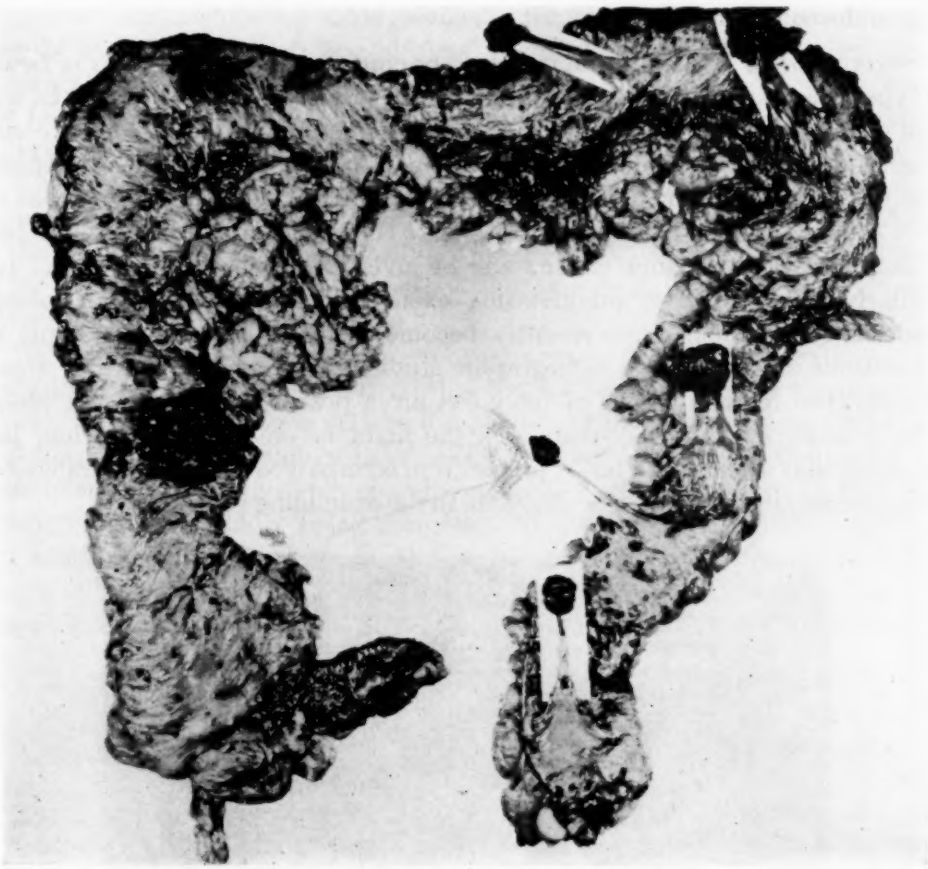

FIG. 3. Resected colon containing multiple benign mucosal polyps with early adenocarcinoma in the right colon.

mucosal polyps and cancer of the rectum and colon (Figs. 1, 2 and 3). Thus, if we are to approach the ideal—prevention of cancer of the rectum and colon—we must be familiar with the frequency, the clinical characteristics and the treatment of polyps of these organs.

Cancer of the rectum and colon causes early and typical symptoms: rectal bleeding, alterations in bowel function, or colicky abdominal pain. Unfortunately, benign polyps do not cause symptoms until they are of an appreciable size or are particularly vascular. If, then, we are to find these premalignant polyps, our patients must be examined even before such symptoms develop.

At the clinic and elsewhere it is reported that benign mucosal polyps are found in at least 5 per cent of all patients, regardless of age or sex, in whom sigmoidoscopic examinations are performed. Helwig (6) stated that in his autopsy series, benign polyps were found in 25 per cent of patients between 70 and 80 years of age; in 22 per cent of those between 60 and 70, and in 16 per cent of those between 50 and 60. The importance of including routine sigmoidoscopic examination in older patients cannot be overemphasized.

**Sigmoidoscopic examination**

Several points in this procedure should be emphasized. The majority of benign polyps, when found, are small. In our recent series of some 400 patients, over half of the polyps were less than 0.5 cm. in diameter. In order to observe such small lesions during sigmoidoscopic examination, the bowel must be prepared. The mechanics of giving patients cleansing enemas in an examining room has not been satisfactory and has been a deterrent to this diagnostic procedure. We have found, however, that such enemas can be given without undue difficulty, particularly since effective, nonirritating enema preparations in small, plastic, disposable containers have recently become available. If sigmoidoscopic examinations are to precede radiographic studies of the colon (and they always should when organic lesions of the colon are a possibility) the patient should take a laxative, preferably castor oil, the night before the examination. It is desirable that when such a bowel preparation is employed for these examinations, adequate suction apparatus be available to the examining physician.

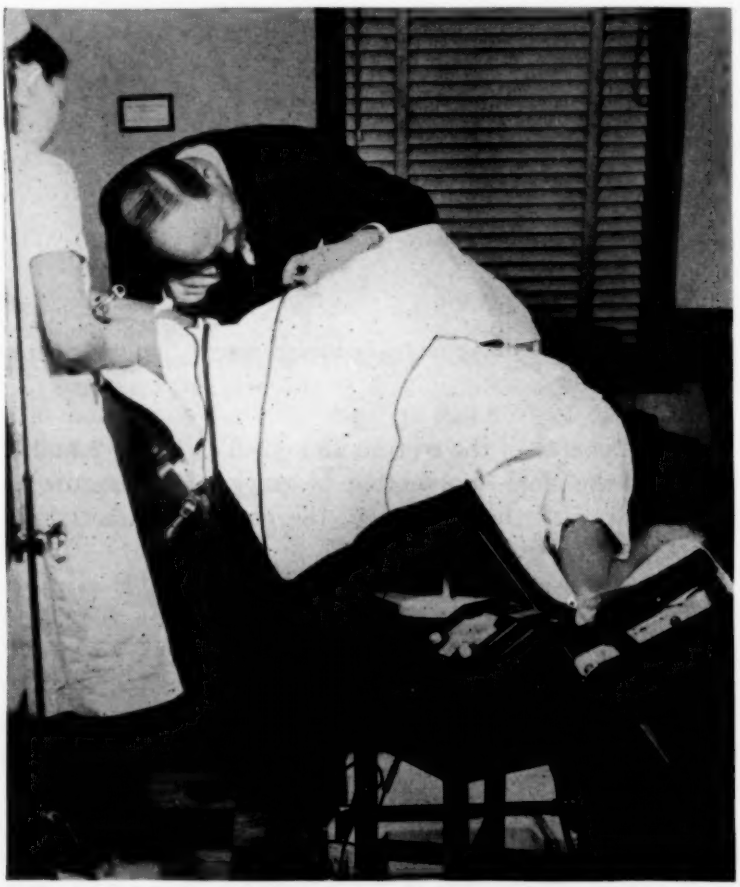

FIG. 4. Patient being sigmoidoscoped in inverted position. Fulgurating tip is used, through the sigmoidoscope, to fulgurate small, benign mucosal polyp in ampulla of rectum. Note attached suction equipment.

Patients who are obese, elderly, feeble, or for whom an anesthetic is required, may be examined in a left lateral Sims' position. A knee-chest position is satisfactory for three fourths of all patients. The inverted position, which allows the rectosigmoid angle of the bowel to straighten out in most patients, is even more advantageous (Fig. 4). A careful and complete sigmoidoscopic examination with preliminary bowel preparation is an ordeal for many patients, but we are repeatedly impressed with the high percentage of patients who, after completion of the examination, state voluntarily, "Doctor, you know one reason why I came to see you is because I have understood that you do such complete and careful examinations."

The equipment necessary for a routine sigmoidoscopic examination is not complicated or expensive, in contradistinction to that necessary for the treatment of any benign lesions which may be discovered. In the past, our medical schools and hospital training centers have been backward in teaching the use of this instrument and the importance and significance of examinations of this type. This situation is rapidly being corrected. At the Lahey Clinic the Fellows in our surgical training program are thoroughly indoctrinated in the use and significance of the diagnostic equipment necessary for the detection and treatment of these lesions (Fig. 5). It is to be hoped that in the future the sigmoidoscope will be

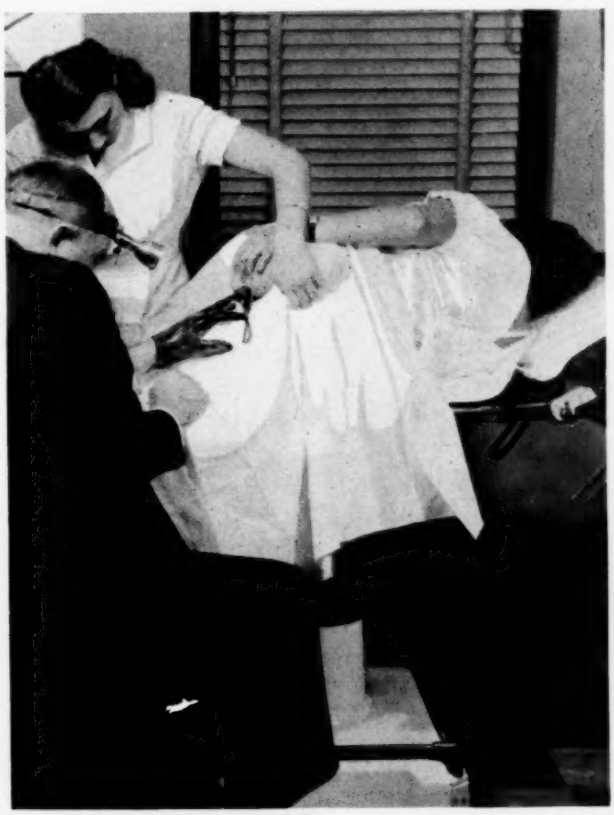

FIG. 5. In patients with rectal bleeding, anoscopic visualization of the anal canal must supplement sigmoidoscopic examination, when disease of the anal canal is suspected.

considered as essential a part of the examining physician's armamentarium as the stethoscope, the ophthalmoscope and the vaginal speculum. The benefits obtained from the use of this instrument will be equal to those obtained by other diagnostic apparatus of this type. Treatment of benign polyps of the colon and rectum may be a complicated problem and some special training and experience in this field are desirable for physicians who wish to treat such lesions. It is encouraging to note that, largely through the efforts of the American Proctologic Society over the years, there is now a recognized Specialty Board of Proctology, and not only is there an increasing number of men in this field with special training, but an ever-increasing number of opportunities among our teaching centers for this training and experience.

**Treatment of polyps**

It is not my purpose to go into the details of the treatment of rectal and colon polyps. Clinically, 70 per cent of polyps in the colon and rectum are within reach of the 25-cm. sigmoidoscope. The majority of these polyps may be removed or destroyed by local treatment. For those above this point, radiographic methods must be relied on for detection (Fig. 6), and laparotomy is necessary for their removal. Clinically, there are two principal types of rectal and colonic polyps, namely, the discrete or multiple adenoma (Fig. 1) and the papillary adenoma or villous tumor (Fig. 2). Their potentials, so far as the development of

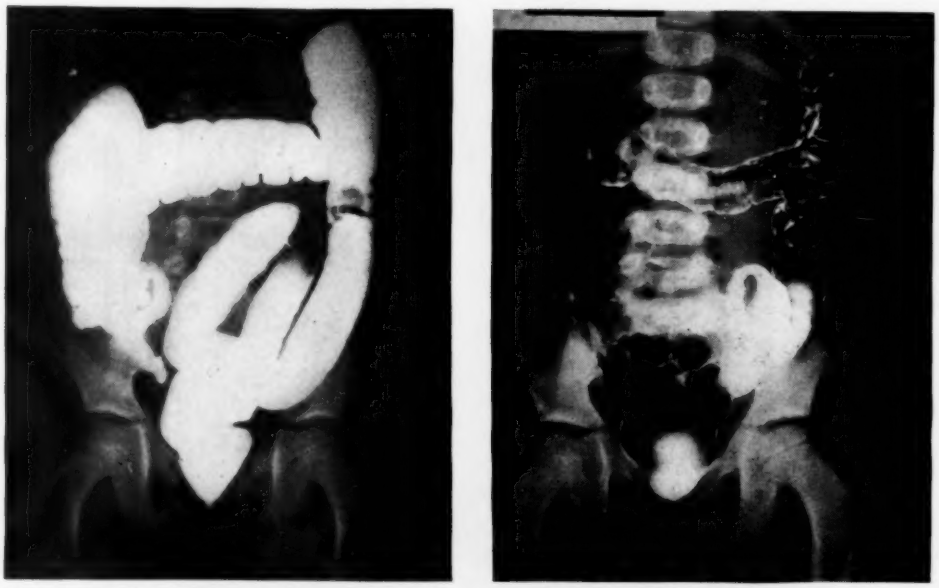

FIG. 6. Benign mucosal polyp of left colon, on pedicle, visualized by both barium enema (A) and contrast air (B) techniques. For satisfactory radiographic studies, the colon must be prepared carefully and be empty of fecal material at the time of examination. For complete colon studies the air contrast technique frequently will reveal polyps that may be overlooked with the usual barium enema study. (Courtesy of the American Journal of Surgery.) Cattell, R. B.: Surgical treatment of polyps of the large intestine, *Am. J. Surg.* **76:** 733–742 (Dec.) 1948.

malignancy is concerned, are probably about equal, although this point is disputed by many. Once a benign adenoma has been completely removed there is little chance that it will recur. On the other hand, the removal of the papillary adenoma by any means short of resection may be unsatisfactory because of the tendency of these tumors to spread laterally and recur. Those patients with multiple polyps and all those with the congenital type of polyposis (which fortunately is rare and occurs primarily in the younger age group) require radical surgical procedures.

### Cancer

The differential diagnosis of cancer in polyps may be one of the most difficult problems faced by the surgeon and the pathologist. We have described (7) the criteria for malignancy which we believe has withstood the test of time.

Three characteristics are important for the diagnosis of cancer in polyps of

FIG. 7. Microscopic section of benign mucosal polyp. Cancer may originate in any portion of such a tumor. Histologic study adequate to determine the presence or absence of cancer must include sections of all portions, that is, the periphery, stalk and base of such a polyp.

the colon and rectum: anaplasia, irregularity of architecture and actual invasion. Either of the first two characteristics—anaplasia and irregularity—may be present without the existence of true cancer clinically. The presence of mitotic figures or of irregular architecture has repeatedly made it difficult for the inexperienced pathologist to detect cancer in these tumors.

It must be recognized that cancer may originate in any portion of a benign rectal or colonic polyp; and before such a tumor can be considered benign, a histologic study must be made of the entire polyp, together with its pedicle and base (Fig. 7). Biopsy specimens taken from the periphery of such tumors are of value when they show actual invasive cancer, but such examinations are not conclusive unless they involve representative sections of the entire polyp.

It is very important in the consideration of patients who have had polyps of the rectum or colon, as well as of those who have had cancer, that such patients undergo follow-up studies indefinitely. In a recent study, not yet complete, of 400 patients with these lesions, follow-up study showed that either polyps or cancer developed again in 6 per cent. This figure will increase as more time elapses for further study.

## SUMMARY

Statistics are given to support the well recognized fact that the number of elderly patients in the United States is constantly increasing. Statistics also reveal that next to the cardiovascular diseases, cancer is the principal cause of death in the United States at the present time in both males and females. The importance of prevention, early detection and treatment of malignant disease, therefore, is increasingly important to all of us. Cancer of the colon and rectum is one of the commonest of the various forms of malignant disease.

The ideal approach to the cancer problem is prevention. The majority of malignant lesions of the colon and rectum originate in a pre-existing benign mucosal polyp. If increasing numbers of patients, particularly in the older age groups, are sigmoidoscoped as a part of every complete physical examination, these premalignant lesions will be found in increasing numbers. With their removal, the ideal in the treatment of colonic and rectal cancer will be approached.

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# FRACTURES IN THE ELDERLY PATIENT

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## FACTORS OF AGE AND SEX

Fractures occur at all ages. There is a sharp rise in the number of fractures after the age of 70. Only in the years of early adulthood does the incidence almost approach that in the group over 70. During the intervening years, fractures seem to be about evenly distributed among the various age groups.

There are several important differences in the nature of fractures in the early adult group and in the group over 70. It is an understanding of these differences and their causation that is essential in selection of treatment in the aged.

The distribution of fractures between the sexes is also reversed in the older age group. After the age of 70, fractures are more common in women than in men, in a ratio of three to one. Presumably this is the aftermath of the comparatively sudden severe menopausal loss of sex steroid, whereas in the male such changes come more gradually, with less disturbance of steroid production. Moreover, physical activity in men is usually greater and continues until a more advanced age. The greater exposure of the young man to violence is self evident.

## ETIOLOGY

In the elderly patient, the fracture is likely to occur without trauma, or at least as a result of a minimum of force, and the fracture is more likely to be severely comminuted. This contrasts sharply with the situation in younger persons, in whom violent force is the rule and comminution is not so frequent.

Although many accidents occur in the upper-age group, usually the fracture results from a minor fall, for which the patient is unable to account. In most cases falling occurs when the patient loses equilibrium because of the roughening of the articular surface of the hip, knee, and under-surface of the patella. These changes are arthritic in nature and consist of severe alterations in the cartilage as well as in the bone.

Trauma (1) is thus seen to be of minor etiologic significance in the high incidence of fractures in the aged. The cause of the increasing number of fractures as people grow older, therefore, must lie elsewhere.

Observation of cases on an extremely active fracture service leads us to believe that there are many factors involved, all of them concerned with the normal process of aging. Most important of these is a gradual disturbance of bone metabolism, giving rise to osteoporosis (2). This may take the form of senile osteoporosis, in which the bone has a normal mineral content and normal osteoblastic and osteoclastic activity, but in which there is a deficiency of the organic matrix into which mineral salts are deposited (3). Histologically the bone is

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normal, except for relatively large lacunae and thin cortical walls and trabeculae. This condition is chiefly a matter of deficiency of protein from which the matrix is formed (4). The blood protein level is affected by the dietary habits of older people. There is often a decreased protein intake, resulting in a low concentration of protein in the blood (5, 6). If there is also increased activity of the adrenocortical hormone S (sugar hormone) because of removal of the inhibiting action of testosterone, a further depletion of the protein reserves ensues (7).

Osteoporosis in the elderly also results from a decrease in the production of steroid sex hormones, which stimulate osteoblastic activity generally. These hormones, particularly testosterone, are important in inhibiting the adrenocortical S hormone. It follows that adrenocortical osteoporosis can also exist and influence osteoblastic activity, *e. g.*, when large doses of cortisone or ACTH are administered (8, 9).

Osteoporosis of disuse must also be considered as an etiologic factor in fractures of the aged, since it is an important determinant in treatment. This condition results largely from relief of the normal stresses and strains upon the skeleton, with consequent diminished osteoblastic response. There is no reduction of osteoclastic activity, however, and serious skeletal weakening occurs in association with the mobilization and excretion of large amounts of mineral salts by the kidneys. This process is postulated on a concept of bone metabolism which, although questioned in recent years, has not been convincingly disproved. Wolff's law is still applicable in fracture management. It is readily apparent that any prolonged bed-confining illness will make an older person susceptible to fractures. Disuse osteoporosis should always be considered in planning the care of elderly fracture patients, because prolonged immobilization will only accentuate an already grave bone disturbance by adding the complication of disuse atrophy (10, 11).

Other factors contributing to the increased incidence of fractures in the elderly patient are: (a) generally decreased cellular activity; (b) decreased muscular tone; (c) diminished proprioceptive and reflex activity; (d) cerebrovascular insufficiency, (e) malignancy, principally metastatic, (f) vascular changes in the form of arteriosclerosis, and, less importantly, (g) cardiac insufficiency resulting in deficient blood supply to the skeleton. It is questionable whether deficient blood supply to the skeleton is significant in the etiology of fractures in the older patient; but it is most important in any consideration of treatment, inasmuch as sufficient circulation is essential to union.

## TREATMENT

Fractures in the elderly patient may and do occur in any of the bones of the skeleton. They are commonest, however, in the spine, the proximal end of the femur, and the head and neck of the humerus.

In general, it may be said that the treatment of fractures in people over 70 is essentially the same as the treatment in younger age groups. Surgical intervention is not contraindicated by the age of the patient; on the contrary, the advanced age of the patient is often the most compelling indication for an open reduction and internal fixation.

## General considerations

*History:* The history should be elicited, with particular reference to physical activity prior to the accident. It is necessary to know whether or not the patient was active every day, performing useful work, or leading a largely sedentary life with little or no demand on physical structure.

*Examination:* Physical examination should be a searching one, and thorough laboratory investigations should include complete chemical analysis of the blood, an electrocardiogram, and roentgenologic examination of the chest.

*Classification:* We have come to classify older patients routinely into four groups, according to the current state of health: A) Excellent, meaning no apparent cardiovascular-renal insufficiency or other disability that might preclude anesthesia and surgery; B) Good, meaning some debilitating changes but with evidence of sufficient cardiovascular-renal reserve to withstand surgery; C) Fair, meaning virtually without reserves, but if the indications for surgery are compelling enough, the operation may be performed provided preoperative preparation is meticulous, and careful anesthesia is planned to suit the patient's particular need; D) Poor, meaning no reserves at all, or the presence of some other disabling condition which contraindicates surgery.

*Preparation:* Before definitive therapy is instituted, whether operative or otherwise, preliminary treatment is divided into two phases:

1. Symptomatic—including treatment for shock, with small transfusions if required, and the administration of small doses of analgesic for pain. (One of the best treatments for shock in fracture cases is immobilization in traction or a moulded plaster-of-Paris splint.)

2. Supportive treatment includes a high-protein, high-carbohydrate diet; combined estrone and testosterone injections (7); supplemental vitamins, particularly C and D (12); hemopoietic drugs or blood transfusions as indicated; bolstering of cardiac reserves; and correction of poorly controlled disease states, such as diabetes. Calcium therapy is not indicated. We have found that in patients with severely depleted protein reserves, repeated small blood transfusions restore blood protein faster and more effectively than the administration of the usual protein concentrates, although these, too, are used if both are available.

## Spine

Fractures of the spine are almost always of the compression type and usually involve the lower dorsal, or upper lumbar vertebrae. One or more spinal segments may be involved. The compression occurs with little or no trauma in most cases, and often pain is the only symptom. After the diagnosis has been made, the patient is placed in bed with his head at the foot of the bed so that any degree of hyperextension needed may be obtained by elevating the break in the bed ordinarily used to flex the knees. The patient is allowed to remain in this position until physical examination has been completed and there is assurance that the abdominal distention frequently seen has subsided or will not develop. In older patients, the paralytic ileus which gives rise to the abdominal distention

is not so common. When it does occur, it is not so severe, since the trauma is often too slight to cause any appreciable retroperitoneal hemorrhage, which is generally regarded as the etiologic factor.

As soon as the patient's physical and mental condition permits, the body is immobilized in a plaster body jacket, which is applied with the patient stretched between a surgical cart and a table after the manner of Watson-Jones. This jacket has a round opening over the abdomen, to facilitate breathing, and extends from the sternal notch to the symphysis pubes. Patients tolerate this cast well. It is preferable to a brace in the early treatment, for the same reason that it is preferable in younger patients, namely, because control of the treatment is maintained; a brace can be removed at the patient's whim, with disruption of treatment. This is an especially important consideration in treating the elderly patient, because sympathetic friends and relatives will encourage the removal of the brace and jeopardize the end result. The usual course is to allow the cast to remain on for about three months. It is then replaced with a metal back brace, which differs from the well known Taylor brace by the addition of metal extensions anteriorly up to the sternal notch, effectively preventing forward flexion at the waist. This brace is left on for a variable length of time, depending upon the progress of bone growth in the affected vertebrae, as shown by roentgenograms.

**Proximal end of femur**

Fractures in the proximal end of the femur have been discussed extensively in the literature. It might not be superfluous to mention, however, that in the elderly patient the possibility of aseptic necrosis of the head, following a fracture through the neck, makes an early accurate pinning of the fracture mandatory. This permits the patient to be up in from seven to ten days postoperatively, thus bringing into play as soon as possible the natural aids to bone repair, namely, stress and strain, and consequent increased muscle tone and improved circulation. The use of an ischial non-weight-bearing caliper is routine on our service and the caliper is worn until roentgenographic evidence of healing has appeared.

In cases of subcapital fracture, aseptic necrosis is inevitable. Removal of the head and immediate arthroplasty, with early ambulation without a brace, provides a course of treatment which is simple, relatively free from shock, and permits an early return to normal activities.

In those cases in which there is aseptic necrosis of the head and the patient's general physical condition warrants, some type of arthroplasty is indicated. We prefer a modication of the Whitman reconstruction. The chief differentiating points of this procedure are: (a) osteotomy and removal of the lesser trochanter and the posterior trochanteric bulge, and (b) osteotomy and transplantation of the greater trochanter. This allows a better fitting of the reconstructed neck in the acetabulum and provides free range of motion in all directions (13). Even in older patients, we prefer this operation to any of the various replacement-type arthroplasties, which in our experience do not hold up under use and do not result in a painless hip. Arthroplasty, with the modification suggested, does give a functional painless hip. A replacement arthroplasty can be performed as a last

resort in the event that the necrotic process continues with further destruction of the neck. To date, however, this has not happened in any of our cases.

**Head and neck of the humerus**

Fractures of the head and neck of the humerus in the patient past 70 fall into four general classifications: (a) impacted necks with little or no displacement, (b) adduction or abduction fractures with angulation and overriding, (c) severely comminuted heads, and (d) fracture of the neck, with or without displacement and dislocation of the head.

Impacted fractures of the neck of the humerus in the elderly patient require no particular treatment other than immobilization in a plaster Velpeau cast or a sling with an ace bandage swath. Immobilization is maintained for three weeks, followed by early motion, use being made of the pendulum exercises. The choice of treatment for adduction or abduction type fractures with displacement depends upon the general condition and age of the patient. In the very aged and debilitated patient, it may be better to defer all treatment or, at most, to apply a plaster-of-Paris cast of the hanging type, which will permit the patient to be ambulatory. This procedure is particularly applicable if the patient's history is one of limited activity. If, however, the patient's general condition is good and the history reveals that he has been previously active, traction should be tried, with the arm and hand in full supination and extension for eight to fourteen days, followed by the wearing of a plaster Velpeau bandage for three weeks if reduction is effected by the traction. If reduction fails to take place after trial, and soft tissue interposition is suggested, then the treatment of choice is open reduction with screw fixation, followed by a plaster Velpeau cast worn for three weeks. In either case, active pendulum exercises are instituted as soon as the cast has been removed in order to prevent, insofar as possible, limited motion or a frozen shoulder.

In fractures involving the head of the humerus, if the comminution is minimal and displacement of the fragments has been negligible, the simple application of a plaster Velpeau cast, or a sling and swath, will usually give a satisfactory functional result. If comminution and displacement are severe, however, early removal of the head should be carried out, with reattachment of the supraspinatus and infraspinatus and subscapularis tendons. Because of the character of the shoulder joint, a satisfactory painless and functional end-result may be anticipated. Failure to remove the head leads to malunion or to aseptic necrosis, either of which results in a useless and painful shoulder. Our experience has been that any attempt to reduce these severely comminuted heads surgically, with or without internal fixation, leads to necrosis. In 2 of our earlier cases chronic osteomyelitis ensued. Subsequent resection of the head, however, resulted in a functioning shoulder. When the head has been dislocated with a fracture of the neck, removal as described is simple and effective.

SUMMARY

Fractures in the aged patient occur more frequently than in any other age group. There may be no associated injury, or only minimal trauma. These frac-

tures are usually severe and there is a noticeable tendency to comminution. The reason for this is a general slowing down of the bodily functions, with disturbances of steroid and adrenocortical metabolism, along with decreased physical activity.

Treatment should be based on an evaluation of the physical status of the patient prior to the fracture and a careful analysis of the patient's state of health at the time he presents himself for care. In cases in which the general physical condition has been satisfactory, in which the patient has been active, performing useful work up until the time of the injury, and in which the patient's current state of health is good, one is justified in instituting active, definitive, even reconstructive treatment.

In cases in which the patient's life has been more or less sedentary, physical condition poor, or the mental state impaired, one is justified in offering a minimum of treatment, with the objective only of getting a functioning part, without great interest in perfection of function or anatomic reduction and union. This is particularly true in cases of fractures of the head and neck of the humerus. In these instances even a synarthrosis is preferable to extensive operative procedures, which could cause the death of the patient from operative shock.

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# Editorial

## RETIREMENT AND THE RETIREMENT AGE

Increasing attention has been focused during the past few years on the problems of the aged, the question of retirement, and the appropriate age for retirement. Although these subjects have been discussed at length, a concrete solution has not been reached; nor, so far as I have been able to determine, has a concerted effort been directed toward solution of these problems. Social security and old age pensions are but a step in the right direction. These benefits are by no means the final answer to a social problem which grows more complex as medicine advances, and the specific answer is still to be found.

The term 'aged' as used here means persons who have reached the 'retirement' age. Too often it means people who have been forced to leave their jobs because of an organizational policy fixing retirement at a specified age. The important question is: What should this age be? Some organizations, including our own hospital medical boards, arbitrarily call for retirement at 65 years. Why and how did they arrive at this age? Is chronologic age an accurate gauge of a man's fitness to carry on his duties? If such methods are not accurate, then how should one decide when an employee should be retired?

In reviewing this subject, I have been unable to find that a sound scientific basis was used in selecting any age for retirement. It is probable that 65 was chosen by some one group or organization and, a precedent having been set, this age received general acceptance as proper for retirement; but this took place many years ago and it is unlikely that the increasing span of life was considered. Today, as a result of medical progress, there are many men and women who are just as capable—perhaps even more capable—at 65 as during any other period of life. Winston Churchill was over 65 when he became Prime Minister during World War II. According to Poor's Directory, 28 per cent of America's top executives are 65 or over and so are 40 per cent of our Senators and 21 per cent of our Representatives in Congress.

An individual may be 65 years old chronologically and 50 to 55 years old physiologically; that is, his physical capacity and the state of his tissues as a whole may be those of a man of 50 to 55. This is also true psychologically. The man of 65 may have the same enthusiasm, drive, and ability to plan for the future as a younger person. In fact, with his experience and seasoned judgment, the older man can, and often does conceive and execute bold plans or solve problems that are insurmountable to the younger mind.

To base retirement on a chronologic age is in my opinion completely unreasonable. I believe each case should be decided on its own merit, according to standards established for determining fitness for "duty." In attempting to formulate such standards, many factors—physiologic, human, economic—must be considered. Should physical standards be identical for every type of work? If so, can a worker be transferred to a less strenuous job and will he consent to a transfer which

might mean less salary or loss of seniority rights? If older people are employed, will the time lost from work following a minor accident exceed that in the younger age group? Is their productive capacity as great?

A survey by the Bureau of Labor Statistics a few years ago among workers 65 to 69 years of age showed 3.3 days of absenteeism per 100 days, whereas the rate for workers 25 to 29 years old was 4.3 per 100 work days. Nondisabling injuries per million work hours totaled 1,500 among the 25–29 age group, in contrast to a total of 430 for the group aged 65 and over. A more recent survey by the Federation Employment Service of New York revealed that of workers between 40 and 60 years of age, 42 per cent were judged superior, 41 per cent equal, and 17 per cent inferior to the younger worker.

In the event of more serious accidents to the older worker, will the death rate be higher because of the prevalence of arteriosclerosis or other conditions common among the older group? For example, will head injuries precipitate cerebral thrombosis or cerebral hemorrhage? Is the manual laborer with hypertension more prone to accident? Is a truck driver with hypertension more accident-prone because he is more likely to be afflicted with a coronary thrombosis or cerebral thrombosis or hemorrhage? Should we insist upon more rigid retirement standards for the truck driver because of the serious consequences to others that may follow an accident involving a truck?

It has been said that the ability to organize and make valid decisions is the first aptitude to disappear with approaching age. Executive ability is a special, above-normal attribute possessed by a few. As such, it may be lost more quickly as age advances than the ability to perform routine clerical or mechanical work. We must, therefore, adopt a realistic attitude toward retirement of supervisory and executive personnel, in order not to burden our organizations with dead wood. It is possible that the standards set for executives should be higher than those for the ordinary worker, but any hard and fast policy of retirement at a set age is unsound.

All decisions concerning retirement should be made by a thoroughly impartial panel after a complete physical examination and survey of past health and performance records submitted by the company's medical department and the head of the employee's department. The fact that a man is fit and chooses to continue work does not guarantee that he shall remain indefinitely in his job. His case may be reviewed any time that his service record indicates habitual below-par performance. On behalf of the employee, the fact that he continues beyond the retirement age does not mean that he forfeits the right to retirement later when he wishes; but some arrangement must be made whereby an employee will remain for an agreed-upon time in order that industry can plan for the future.

In this discussion of retirement and the appropriate retirement age, one of the most important questions is always overlooked: "How many of us can afford to retire at any age?" Under existing laws, a self-employed individual is not allowed to put aside anything during his highest earning years and it is almost impossible for him to provide for his old age.

If those responsible for our laws are really interested in the problems of the aged and the welfare of the nation as a whole, they should be willing to give those who can and will do so, a chance to provide for their old age during their productive years. Instead, our lawmakers have consistently refused the self-employed individual the right to try to provide for his own security or retirement at any age. A corporation can always set up a pension for retirement of its personnel, but the self-employed person cannot put aside one nickel for his old age until Uncle Sam has taken his share. A doctor, for example, cannot deduct for a pension fund or retirement annuity; in fact, he cannot deduct the premiums on health and accident insurance that he must carry to pay the office overhead in case of accident or illness.

This refusal to permit the self-employed to arrange their own old-age security is responsible in large measure for the swollen rolls of our overburdened charitable and welfare agencies. They should be given a chance to provide for their own security in their old age. A bill allowing a self-employed individual to put aside a certain amount of his earnings, tax-exempt, for his old age during the fruitful years, has been proposed to Congress on more than one occasion. Although he would have to pay tax on the amount used in any given year, his earnings probably would be lower and therefore the tax rate would be lower. Even this would be of some help to him, but the bill has been rejected repeatedly. Why shouldn't the millions of self-employed in this country be granted the same rights as a corporation, and why does Congress persist in its refusal to give them a chance to take care of themselves in their old age? Does the Congress prefer that charitable or welfare agencies assume the responsibility of providing for these people? If we do not grant the self-employed a chance to prepare for their old age, we run the risk of increasing the growing number of persons who must be taken care of by government or welfare agencies. There are, in this country, more than 12 million people over 65 years of age and only about 35 per cent of this group are employed, or married to employed persons. Fifty per cent are placed in the ignominious position of being dependent upon their children or the community. Approximately 32 per cent of our eligible voters may be classed as belonging to the older age group. This does not mean that they are over 65, but that they have reached an age when they must begin to give serious consideration to what will happen to them in their old age. This number is increasing each year, and as the problem becomes more serious, the need for solution grows more pressing.

The age selected as proper for retirement also becomes an economic factor. What effect does forced retirement have and what effect will it have upon our economic welfare? In 1850, only 1 out of every 38 persons lived to be 65 or more. Today 1 out of every 12 reaches 65 or more; by 1975 this figure will be 1 out of every 9. If everyone in this group is retired, the cost will be about 9 billion dollars a year by 1975. Taking into consideration the total number employed at any one time and excluding the retired from the tax-paying public, the total cost of living for all people in the country will have to be borne by about 40 per cent of the the people.

In conclusion, the retirement age should be a flexible one, regulated only by the responsibilities of the job, type of work, and physical or psychosomatic fitness of the employee for his job, be he executive, supervisor, clerk, skilled or unskilled worker. The weight of evidence indicates that establishment of a chronologic age for retirement is unsound and scientific. Any rule that eliminates the fit with the unfit or discards the good with the bad is a reflection upon the society that imposes such a regulation. The more imperfect the society, the more its members are herded en masse. The more perfect the society, the greater the degree of skill with which it solves the problems of the individual. If, however, our society is so imperfect that we do not consider the individual but continue to herd our elders into retirement at a chronologic age, then let this age be in conformance with life expectancy. If life expectancy is 68, the retirement age should be raised to 68. Perhaps it would be more suitable to increase the retirement age by half the life expectancy in years over 65: that is, with life expectancy 68, the retirement age would be 66½ years.

The views expressed here may not agree with those of the reader, but I believe that everyone will agree there is a problem and that the medical profession must assume its share of the responsibility in solving this problem.

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The 31st Annual Convention of the National Society for Crippled Children and Adults will be held *November 3, 4 and 5, 1954,* at the Hotel Statler, Boston, Massachusetts. This is a meeting of international importance, which will bring together authorities in all the fields of work relating to rehabilitation of the crippled. For information, write to the Society at 11 South La Salle Street, Chicago 3, Illinois.

## BOOKS RECEIVED

*Lung Cancer*. By SEYMOUR M. FARBER, M.D., Associate Clinical Professor of Medicine, University of California Medical School, San Francisco; Lecturer in Diseases of the Chest, University of California School of Public Health. A monograph in The Bannerstone Division of American Lectures in Chest Diseases, edited by J. ARTHUR MYERS, M.D.; 162 pages; 29 illustrations (6 in color); 1954. Charles C Thomas, Publisher, Springfield, Illinois.

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*Medical Relations Under Workmen's Compensation in Illinois*. Published by the Committee on Industrial Health of the Illinois State Medical Society, and distributed by the Council on Industrial Health of the American Medical Association, Chicago, Illinois; 61 pages; 1953.

*Pelvic Relaxations and Herniations*. By JAMES M. WILSON, M.D., Assistant Professor of Gynecology and Obstetrics, Medical College of South Carolina, Charleston, S. C. A monograph in American Lectures in Gynecology and Obstetrics, edited by E. C. HAMBLEN, M.D.; 73 pages; 35 illustrations, 1954. Charles C Thomas, Publisher, Springfield, Illinois.

*Proceedings of the Annual Meeting, Council for High Blood Pressure Research of the American Heart Association, 1953*. Volume II; 94 pages; illustrated; 1954. American Heart Association, New York. Price $2.00.

*Rorschach Responses in Old Age*. By LOUISE BATES AMES, Ph.D., Director of Research, Gesell Institute of Child Development, JANET LEARNED, Ph.D., RUTH W. MÉTRAUX, M.A. and RICHARD N. WALKER, M.A. An extensive Rorschach study of persons between the ages of 70 and 100; 229 pages; 44 tables; 1954. Paul B. Hoeber, Inc., New York. Price $6.75.

*Surgical Infections: Prophylaxis—Treatment—Antibiotic Therapy*. By EDWIN J. PULASKI, M.D., Lt. Colonel, Medical Corps, United States Army; Deputy Director, Division of Surgery, Walter Reed Army Medical Center; Assistant Chief, Surgical Service, Walter Reed Army Hospital, Washington, D. C. A monograph in The Bannerstone Division of American Lectures in Surgery, edited by MICHAEL E. DE BAKEY, M. D. and R. GLEN SPURLING, M.D.; 315 pages, 10 illustrations; 1954. Charles C Thomas, Publisher, Springfield, Illinois.